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TECHNICAL MANUAL

FOR

RADIO RECEIVING SET AN/BRR-3(U)

AUTHORIZATION FOR DOWNGRADE TO UNCLASSIFIED
BY NAVELEX LTR 5600 SER: 166-04531 OF 23 FEB 1971
AND CNO LTR SER: 17680B94.

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NAVY DEPARTMENT

CHANGE 2

INSTRUCTION SHEET

26 June 1962

CHANGE 2 to Technical Manual for RADIO RECEIVING SET AN/BRR-3

NAVSHIPS 93716

This document contains information affecting the national defense of the United States within the meaning of the Espionage Laws, Title 18,. U.S.C., Section 793 and 794, the transmission or revelation of which in any manner to an unauthorized person is prohibited by law.

Field Change 1 - AN/BRR-3 applies to sets A1 through A9 and B1 through B99. Its purpose is to replace four connectors, J607 through J610, with one connector, J618.

1. Remove superseded pages and insert revised pages as indicated below:

Page	Remove	Insert
T.P./ii	Ch. 1/ Ch. 1	Ch. 2/Ch. 2
vii/viii	Orig/Orig	Ch. 2/Orig
ix/1-0	Orig/Orig	Ch. 2/Orig
1-1/1-2	Orig/Orig	Orig/Ch. 2
1-5/1-6	Orig/Orig	Orig/Ch. 2
2-7/2-8	Orig/Orig	Orig/Ch. 2
2-9/2-10	Orig/Orig	Ch. 2/Ch. 2
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2-15/2-16	Orig/Orig	Ch. 2/Orig
5-5/5-6	Orig/Orig	Ch. 2/Orig
5-11/5-12	Orig/Orig	Ch. 2/Ch. 2
5-12A/5-12B		Ch. 2/Blank
5-13/5-14	Orig/Orig	Orig/Ch. 2
6-15/6-16	Orig/Orig	Orig/Ch. 2
6- 21/6-22	Orig/Orig	Orig/Ch. 2
6-41/6-42	Orig/Orig	Ch. 2/Orig
6-61/6-62	Orig/Orig	Ch. 2/Orig
6-63/6-64	Orig/Orig	Ch. 2/Orig
7-1/7-2	Ch. 1/Crig	Ch. 2/Orig

2. Make the following pen-and-ink corrections and mark "Ch. 2" adjacent to the pen-and-ink correction.

First Issued In	Page No.	Ch in Effect	Column or Fig.	Line or Location	Action
Change 2	4-5/4-6	Orig	Fig. 4-2	Upper Left	Change "AT-317/BRR J607 - J610" to "AT-317/ BRR J618"
Change 2	5-4	Orig	1	Step 3, line 5	Draw a star around the number "1".
Change 2	5-20	Orig	Step 1	Normal Indication Column	Change "Less than 200 μv" to "Less than 400 μv."
Change 2	5-20	Orig	Step 2	Normal Indication Column	Change "Less than 40 μv" to "Less than 150 μv."
Change 2	5-21	Orig	Step 3	Normal Indication Column	Change the ratio "4:1" to "3:1."

First Issued In	Page No.	Ch in Effect	Column or Fig.	Line or Location	Action
Change 2	5-28	Orig	Step 5	Preliminary Action Column, line 2	Change "0 vac." to "1000 μv."
Change 2	6-5	Orig	Col. 2 Step 2	line 3	Change " P610" to "P618."
Change 2	6-6	Orig	Col. 2 Step 1	line 4	Change " P610" to "P618."
Change 2	6-8	Orig	Col. 1 Step 3	line 1	Change " P610" to "P618."
Change 2	6-43/6-44	Orig	Fig. 6-33	Middle Top	Change "Main RF Gain" to "Main RF Gang".
Change 2	6-49/6-50	Orig	Fig. 6-36	Lower Left	Interchange terminal numbers 1 and 5 of relay K401.
Change 2	7-3	Orig	Name and Description Column	C201, line 2	Change "straight line capacity" to "straight line frequency".
Change 2	7-13	Orig	Name and Description Column	Z303,	Change "420 cycles" to "120 cycles".
Change 2	7-21	Orig	Ref Desig Column	After J617	Add "J618."
Change 2	7-21	Orig	Name and Description Column	Bottom of Page	Add "See parts list supplement on page 7-1".
Change 2	7-21	Orig	Ref. Desig, Name and Description, Locating Function	J607 J608 J609 J610	Delete REF. DESIG., NAME AND DESCRIPTION, and LOCATING FUNCTION of connector J607 through J610.

3. Destroy superseded pages but not until the complete manual has been checked against the "List of Effective Pages."

4. No Temporary Corrections are superseded by this Instruction Sheet. Insert this Instruction Sheet just behind the front cover immediately above the Instruction Sheet of Change 1.

5. Make appropriate entry on Correction Page.

CHANGE 1 INSTRUCTION SHEET

CHANGE 1 to Technical Manual for RADIO RECEIVING SET AN/BRR-3

NAVSHIPS 93716

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This permanent change revises the book to correct errors and include additional information.

Maintenance Support Activities shall insert this change in the technical manual immediately upon receipt.

1. Remove superseded pages and insert revised pages as indicated below:

Page	Remove	Insert
T.P./ii	Orig/Orig	Ch.1/Ch.1
6-29/6-30	Orig/Orig	Orig/Ch.1
7-1/7-2	Orig/Orig	Ch.1/Orig

2. Make the following pen-and-ink corrections and mark "Ch.1" adjacent to the pen-and-ink correction.

First Issued In	Page No.	Ch in Effect	Column or Fig.	Line or Location	Action
Change 1	vi	Orig	Col 2	above item 6-8	Insert: "o. Adjustment of rear locating pins on receiver chassis."
Change 1	2-10	Orig	Paragraph 2-6a(1)	6	Change "gray" to "gray-white"
Change 1	2-10	Orig	Paragraph 2-6a(1)	7	Change "gray and white" to "gray"
Change 1	4-14	Orig	Fig. 4-13	Lower Left	Change R315 from "27K" to "22K" Change R316 from "3300" to "5600"
Change 1	5-60	Orig	Col 5	Line 6	Change "AN 327" to "AN 328"
Change 1	6-20	Orig	Paragraph 6-7f step 2	Line 1	Change "Replace" to "Place"
Change 1	6-43	Orig	Fig. 6-33	Lower Left	On P613 change pin "2" to pin "7" Change pin "3" to pin "8"
Change 1	6-47/6-48	Orig	Fig. 6-35	Middle	Change R315 from "27K" to "22K" Change R316 from "3300" to "5600"

First Issued In	Page No.	Ch in Effect	Column or Fig.	Line or Location	Action
Change 1	6-49/6-50	Orig	Fig. 6-36	Lower Middle	On P615, change pin "10" to pin "15"
Change 1	6-49/6-50	Orig	Fig. 6-36	Left side	Change value of R416 from "6200" to "4300"
Change 1	6-51	Orig	Fig. 6-37	Upper Middle	Referring to R513 add "see NOTE 2)"
Change 1	6-63/6-64	Orig	Fig. 6-43	Lower Right	Change "+118v" at junction of R628 and R629 to "+70v to +90v"
Change 1	6-63/6-64	Orig	Fig. 6-43	Lower Right	Change "+170v" at junction of R634 and R628 to "+180v to +210v"
Change 1	6-75/6-76	Orig	Fig. 6-49	Middle Right	Change R315 from "27K" to "22K" Change R316 from "3300" to "5600"
Change 1	7-12	Orig	Col 3	R315 line	Change value from "27,000" to "22,000" Change "RC20GF273J" to "RC20GF223J"
Change 1	7-12	Orig	Col 3	R316 line	Change value from "3300" to "5600" Change "RC20GF332J" to "RC20GF562J"
Change 1	7-14	Orig	Col 3	R405 line	Change value from "1500" to "750" Change "RC20GF152J" to "RC20GF751J"
Change 1	7-17	Orig	Col 2	Line 18	Next to R512 add the number "1"
Change 1	7-17	Orig	Col 2	Line 19	Next to R513 add the number "1"
Change 1	7-20	Orig	Col 3	C603 line	Change "Type no. CE51F 350R" to "90348 dwg no. A1056689"
Change 1	7-21	Orig	Col 3	Line 1	Change "AN 327" to "AN 328"
Change 1	7-22	Orig	Col 3	MP611 line	Change dwg no. from "A2183228" to "B2273581"
Change 1	7-25	Orig	Col 3	T601 line 3	Change "250v" to "500v"

3. Destroy superseded pages but not until the complete manual has been checked against the "List of Effective Pages."

4. No Temporary Corrections are superseded by this Instruction Sheet. Insert this Instruction Sheet just behind the front cover immediately above the Title Page.

5. Make appropriate entry on Correction Page.

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1. ARTICLES 0901, 0902 AND 0904 OF CHAPTER 9 OF THE DEPARTMENT OF THE NAVY SECURITY MANUAL - (OPNAV INSTRUCTION 5510.1B OF 10 MARCH 1958).
2. ITEMS (a), (b), (c), (d), (e), (f), (k), (m) AND (o) OF PARAGRAPH 5, SECTION 1 OF THE DOD INDUSTRIAL SECURITY MANUAL FOR SAFEGUARDING CLASSIFIED INFORMATION (DD441 ATTACHMENT, REVISED 1 JUNE 1960).

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EXTRACTIONS FROM CHAPTER 9 OF
THE DEPARTMENT OF THE NAVY SECURITY MANUAL
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ARTICLE 0901 RESPONSIBILITY

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Only one copy of NAVSHIPS 93716 is required to be on board ship.

One maintenance standards book is required to be on board ship for each equipment.

The overhaul and repair manual is not required to be on board ship.

DEPARTMENT OF THE NAVY
BUREAU OF SHIPS
WASHINGTON 25, D. C.

IN REPLY REFER TO

28 August 1961

From: Chief, Bureau of Ships
To: All holders of the subject manual

Subj: Technical Manual for Radio Receiving Set AN/BRR-3, NAVSHIPS 93716

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2. It contains classified information, and is distributed to required users only.

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R. K. James
Chief of Bureau

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TECHNICAL MANUAL

for

RADIO RECEIVING SET AN/BRR-3

ITT FEDERAL LABORATORIES
A DIVISION OF INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION
NUTLEY, NEW JERSEY

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Approved by BuShips: 10 Oct 1960
Change 1: 12 September 1961
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LIST OF EFFECTIVE PAGES

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5-6 to 5-10	Original		

Contract: NObsr-81190
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BUREAU OF SHIPS
WASHINGTON 25, D. C.

IN REPLY REFER TO
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From: Chief, Bureau of Ships
To: All Activities concerned with the Installation. Operation, and Maintenance of the Subject Equipment

Subj: Technical Manual for Radio Receiving Set AN/BRR-3, NAVSHIPS 93716

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R. K. JAMES
Chief of Bureau

RECORD OF CORRECTIONS MADE

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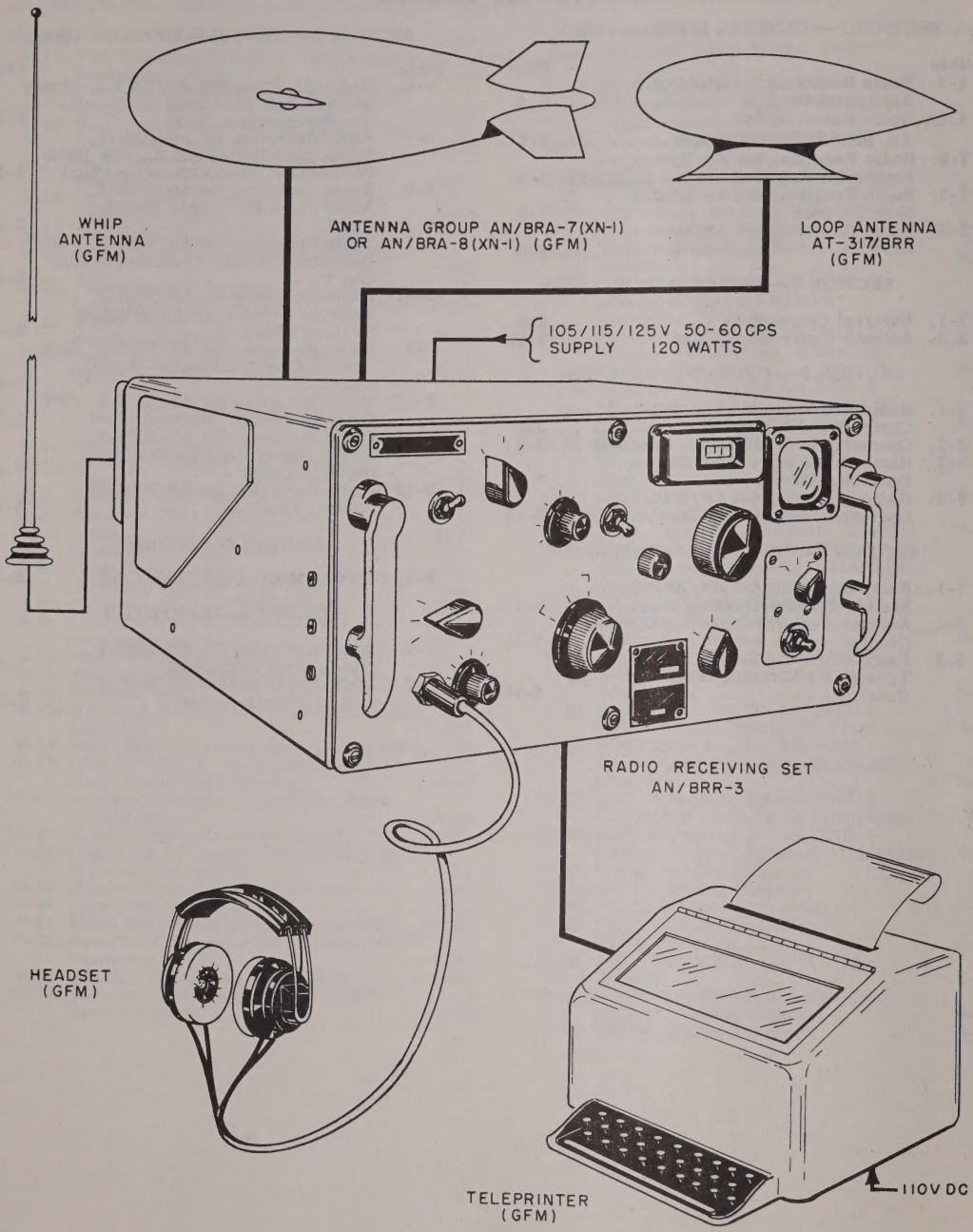


Figure 1-1. Radio Receiving Set AN/BRR-3 and Accessory Equipment

SECTION 1

GENERAL INFORMATION

1-1. PURPOSE AND SCOPE OF THE MANUAL.

This technical manual is provided for use by personnel responsible for installation, operation, and maintenance of Radio Receiving Set AN/BRR-3. It includes sections of instructions for installing, operating, trouble-shooting, servicing, and repairing the equipment. In addition, a section on principles of operation affords an understanding of equipment operation and provides background information necessary to the user in the performance of his job.

1-2. FUNCTIONAL DESCRIPTION.

Radio Receiving Set AN/BRR-3 consists of Radio Receiver R-988/BRR-3, connectors, clamps, and mounting hardware. The receiver is designed for general application aboard all types of U. S. Navy vessels. It covers the frequency range from 14 to 30 kc and is normally used to receive either on-off keying (ICW or A_1) or frequency shift keying (FSK or F_1) types of transmission. The receiver also has the capabilities of receiving facsimile signals (FAX or F_4) when provided with additional terminal equipment, and of being used as a homing device when equipped with a Loop Antenna AT-317/BRR (series).

In use, the receiver is connected to accessory government furnished material (GFM) as shown in figure 1-1. Facilities are provided for connecting three types of antennas; namely, a loop antenna of the AT-317/BRR series, a 50 ohm output impedance antenna system, and either a whip or wire antenna with an output capacitance greater than 1000 uuf. The three types of antennas adapt the equipment for any type of shipboard use. An installation may include one or any combination of the three types of antennas. Selection of an antenna is made simple through the use of the ANTENNA SELECTOR switch on the front panel. Outputs are provided for monitoring with either headphone or teleprinter. A remote tuning output is also provided for use with Antenna Group AN/BRA-7 (XN-1) or AN/BRA-8(XN-1) (float antenna) when it is supplied as the 50 ohm antenna (see figure 1-1).

The receiver is basically a superheterodyne composed of relatively wide band RF and variable bandwidth IF circuits followed by impulse-noise cancellation and narrow band IF circuits. The audio output of these circuits is channeled for use with either headphone or teleprinter.

The output is supplied at a headphone jack for audio monitoring of ICW signals either directly from the narrow band IF circuits as a 2500 cps signal or via converter circuits as either a 1000 cps or 600 cps signal. Selection of one of the three audio tones is accomplished through the use of the AUDIO switch on the front panel. The output of the narrow band IF amplifiers is also processed through a channel consisting of limiter, discriminator, low pass filter, and keyer circuitry to supply a teleprinter drive output when receiving FSK signals. Automatic gain control (AGC) is provided; in addition, a cathode ray tube (crt) indicator is provided for monitoring the operation of the receiver.

1-3. PHYSICAL DESCRIPTION.

Radio Receiver R-988/BRR-3 is designed for either table top or rack mounting. It is contained in a gray enamel metal cabinet 17-1/4 inches wide, 20 inches deep, 8-3/4 inches high, and weighs approximately 85 pounds (see figure 1-2). It is composed of two major assemblies; namely, cabinet assembly and receiver chassis. Generally, the design and layout of the receiver provides easy access to all parts, and most repairs may be accomplished without dismantling. If removal of the major assemblies is deemed necessary, follow the detailed removal instructions provided in Section 6, paragraph 6-4.

a. CABINET ASSEMBLY. - The cabinet assembly (see figure 1-3) includes the cabinet, junction box, and parts of the slide assembly. The receiver chassis is easily withdrawn from the cabinet on its sliding mount (see figure 1-4) and tilted for easy service access (see figure 1-5 and figure 1-6). In any servicing position the receiver will remain in operation without the use of patch cables. The receiver chassis is easily removed from the cabinet by first disconnecting two cable connectors on the rear of the chassis and then depressing the stop-latch buttons on the slide mechanism (see figure 6-2).

The junction box serves as the rear wall of the cabinet (see figure 1-7). The junction box includes the blower, the air filter, the interconnecting cables, all input and output connectors for the equipment, and the blower motor starting capacitor. The interconnecting cables connect the junction box inputs and outputs to the receiver chassis and extend to allow the chassis to be withdrawn from the cabinet for service without the use of patch cables. The blower includes the blower motor, the blower motor bracket, the fan, and the venturi. The junction box cover includes the frame for the air filter.

b. RECEIVER CHASSIS. - The receiver chassis contains all electronic components of the receiver. It is composed of four subassemblies; namely, chassis frame, RF head, rear deck, and narrow band IF filters (see figure 1-8).

(1) CHASSIS FRAME. - The chassis frame contains the power supply, fuses, front panel and controls, crt indicator and related components, and all interconnecting wiring for the remaining three subassemblies. In addition, it provides mounts for the remaining three subassemblies.

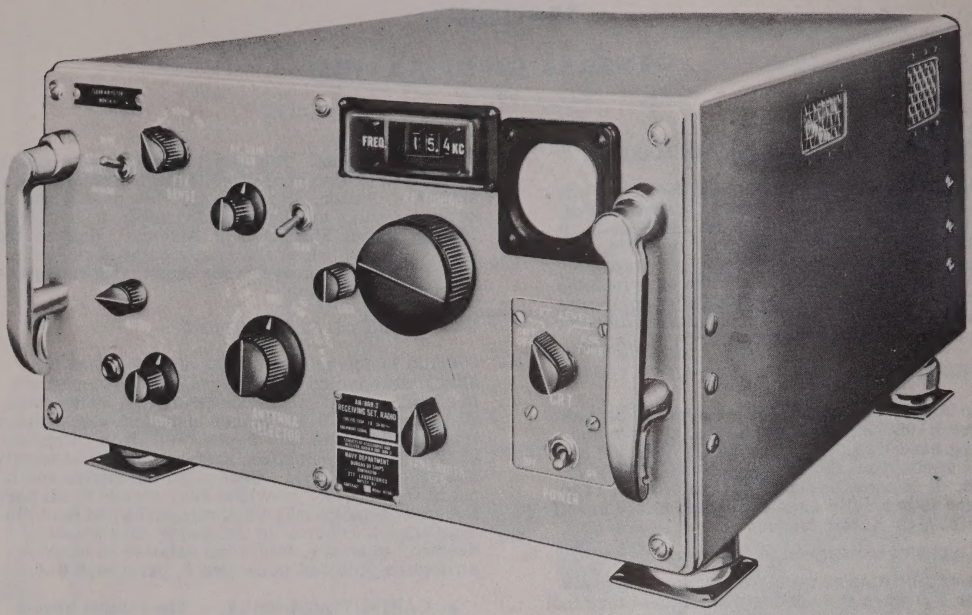


Figure 1-2. Radio Receiving Set AN/BRR-3

(2) RF HEAD. - The RF head is fastened to the chassis frame with three captive screws. It is easily removed without unsoldering any leads by disconnecting two cable connectors, removing two front panel knobs loosened from the rear of the front panel, and unscrewing the dial LOCK. The subassembly includes antenna circuitry, tunable RF unit, and variable bandwidth IF amplifier.

(3) REAR DECK. - The rear deck is fastened to the chassis frame with eight captive screws. Two connectors facilitate its removal without unsoldering any leads. The components of the circuitry contained in the subassembly are laid out on slanted terminal boards providing easy access for testing and component replacement. The subassembly includes impulse-noise cancellation circuitry, narrow band IF amplifiers, AGC circuitry, beat frequency oscillator (BFO) and audio circuitry, FSK limiters, discriminator, low pass filter, and teletype keyer.

(4) NARROW BAND IF FILTERS. - The narrow band IF filters subassembly is fastened to the chassis frame with four captive screws. A single connector facilitates its removal without unsoldering any leads. The subassembly is composed of three narrow band filters.

1-4. FACTORY OR FIELD CHANGES.

Refer to Table 1-1A for information covering field change 1 to Radio Receiving Set AN/BRR-3 and Electronics Maintenance Book (EMB), NAVSHIPS 900,000 for the complete field change. Connectors J607 thru J610 were replaced with one connector J618 on serial numbers B100 and above. This change is made on serial numbers A1 thru A9 and B1 thru B99 by FC-1-AN/BRR-3.

1-5. REFERENCE DATA.

a. Frequency range: Tunable from 14 to 30 kc.

b. Dial calibration accuracy: ±100 cps.

c. Types of reception:

(1) On-off keying (ICW or A_1)

(2) Frequency shift keying (FSK or F_1)

(3) Facsimile (FAX or F_4)

d. Receiver output (audio): 15 mw into 600 ohm load or 45 mw into 200 ohm load (one to three headphones).

e. Receiver output (teletype): Up to 60 ma keyed on-off from an external +110 vdc to +200 vdc supply into a magnet impedance ideally zero; less than 500 ohms and 4 henries for best operation; and 1000 ohms and 13.8 henries as a maximum.

f. Frequency stability: ±2 cps after 120 minutes warmup.

g. Antennas: Optional use of three types of antennas through the use of ANTENNA SELECTOR switch. Three separate input connectors are provided.

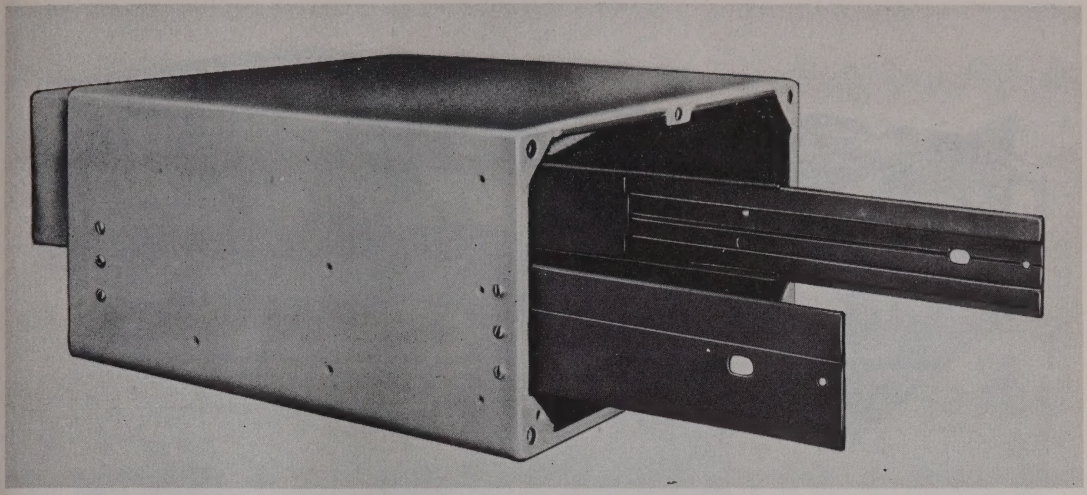


Figure 1-3. Cabinet Assembly

(1) AT-317/BRR input requires an antenna of the Loop Antenna AT-317/BRR series with up to 150 feet of cable. See Section 2, paragraph 2-5 a for instructions in installing any of the three types of AT-317/BRR antennas.

(2) 50 OHM ANTENNA input requires an antenna system with a resistive 50 ohm output impedance.

(3) WHIP input requires either a whip or wire antenna with an output capacitance (including cable) greater then 1000 uuf.

h. Power supply: 105, 115, or 125 volts; 50 to 60 cps; single phase; 1.2 amperes. For teleprinter operation a +110 vdc to 200 vdc (with the teleprinter magnet current rating maximum 60 ma) supply is also required.

i. Intermediate frequency: 2500 cps with selected bandwidths of 60 ±6 cps, 120 ±12 cps, and 170 ±17 cps at 6 db down.

j. Frequency output of BFO: Selection of three fixed frequencies; 2500 cps, 1000 cps, and 600 cps.

k. Frequency range of local oscillator: 16.5 kc to 32.5 kc.

l. Receiver sensitivity:

(1) At the 50 OHM ANTENNA terminal sensitivity is less than 0.02 uv in series with 50 ohms for one-to-one carrier to thermal noise ratio in the 60 cps, 6 db bandwidth.

(2) Using the AT-317/BRR, with the ANTENNA SELECTOR switch in either ATHWART or FORE AFT position, sensitivity is less than 2 uv per meter at 30 kc and less than 4 uv per meter at 14 kc, for a one-to-one carrier to thermal noise ratio in the 60 cps, 6 db bandwidth; 3 to 6 uv per meter with the ANTENNA SELECTOR switch in OMNI position.

(3) Using the 170 cps, 6 db bandwidth for 60 words per minute teletype operation with a ±10 cps frequency shift signal, the carrier required for errorless printing (as limited by receiver thermal noise) is as follows:

(a) For operation with 50 ohm antenna, approximately 0.1 uv in series with 50 ohms.

(b) For operation with AT-317/BRR, approximately 35 uv per meter.

m. Receiver selectivity:

(1) Intelligence bandwidth (postnoise cancel circuit):

BAND WIDTH CPS at 60:	6 db bandwidth approximately 60 cps. 60 db bandwidth less than 3.7 times 6 db bandwidth.
BAND WIDTH CPS at 120:	6 db bandwidth approximately 120 cps. 60 db bandwidth less than 3.7 times 6 db bandwidth.
BAND WIDTH CPS at 170:	6 db bandwidth approximately 170 cps. 60 db bandwidth less than 3.7 times 6 db bandwidth.

(2) Cross modulation and desensitization bandwidth (prenoise cancel circuit):

NOISE CANCEL at WIDE:	6 db bandwidth approximately 1,000 cps.

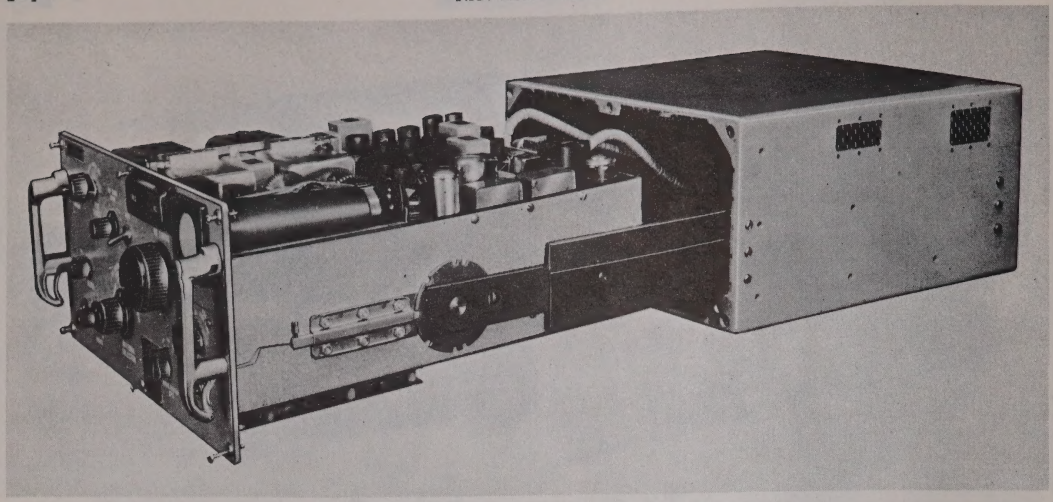


Figure 1-4. Receiver With Receiver Chassis Withdrawn

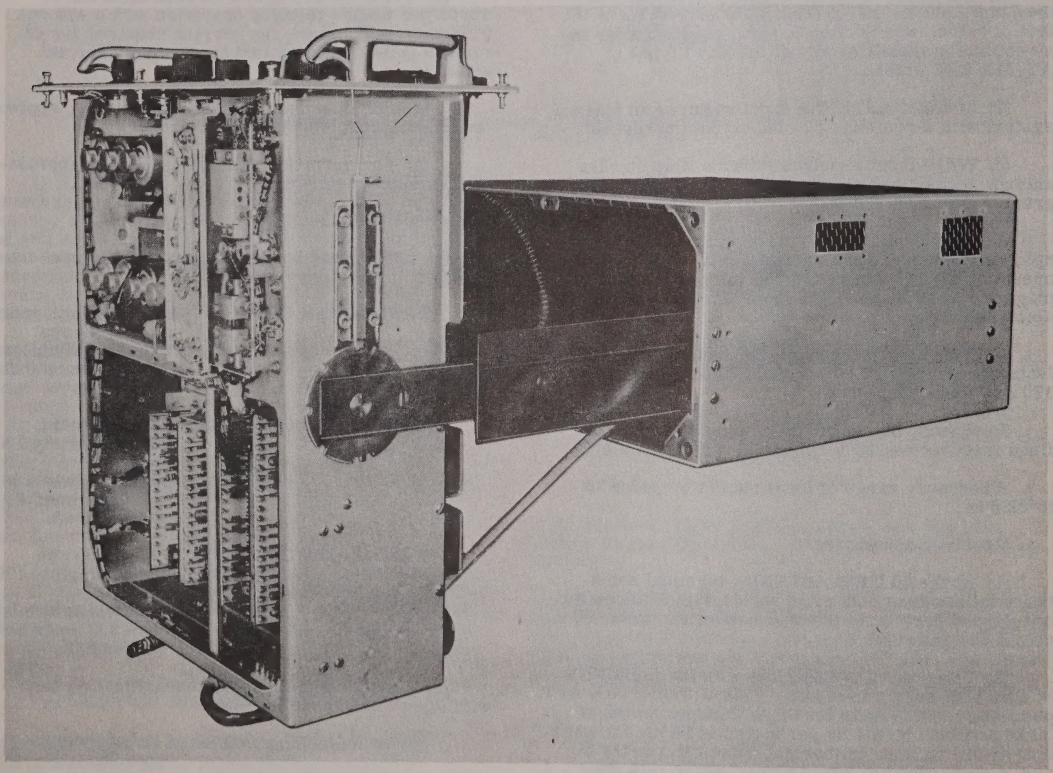


Figure 1-5. Receiver Chassis, Service Position (Access to Bottom)

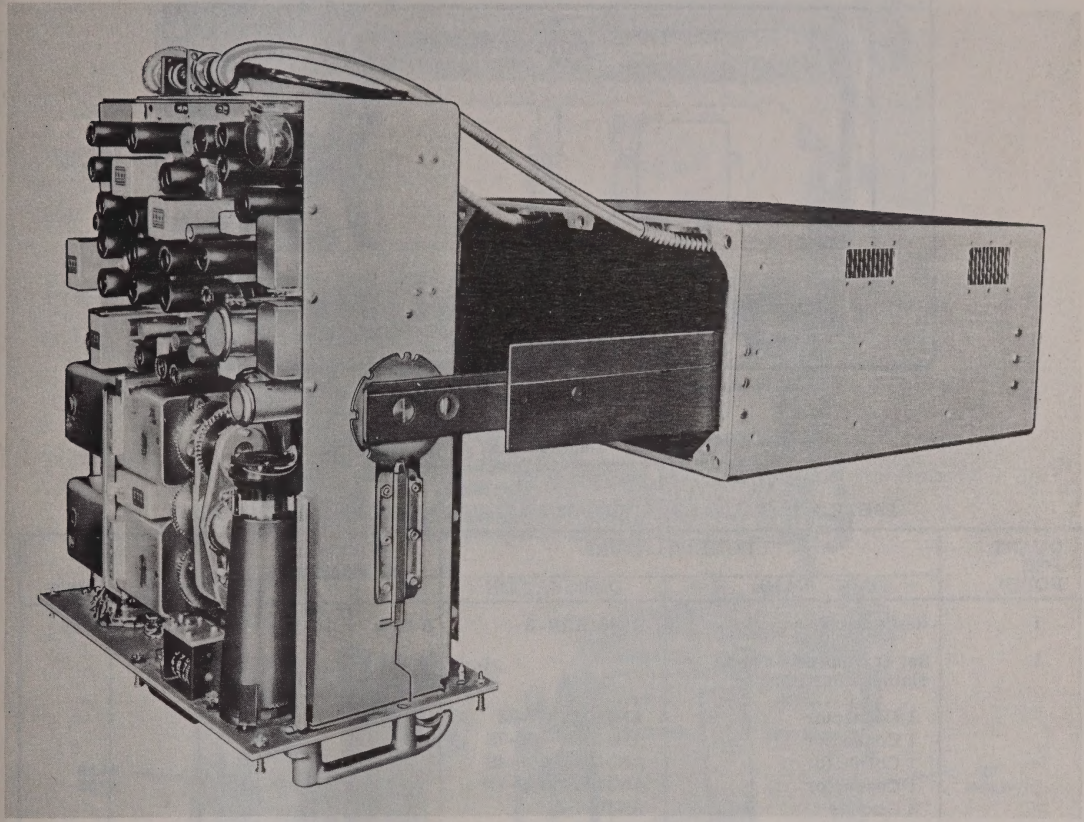


Figure 1-6. Receiver Chassis, Service Position (Access to Rack and Top)

60 db bandwidth less than 3 times 6 db bandwidth.

NOISE CANCEL at NARROW: 6 db bandwidth approximately 170 cps.
60 db bandwidth less than 3.7 times 6 db bandwidth.

1-6. EQUIPMENT LISTS.

a. EQUIPMENT AND PUBLICATIONS SUPPLIED. - Table 1-1 lists and describes all equipment and publications supplied.

b. EQUIPMENT REQUIRED BUT NOT SUPPLIED. - Table 1-2 lists and describes all equipment required but not supplied.

c. SHIPPING DATA. - Table 1-3 provides shipping data.

d. EQUIPMENT SIMILARITIES. - Since there is only one model of Radio Receiving Set AN/BRR-3, this manual is pertinent to all sets of this equipment series.

e. ELECTRON TUBE COMPLEMENT. - Table 1-4 provides the receiver tube complement including semiconductor devices.

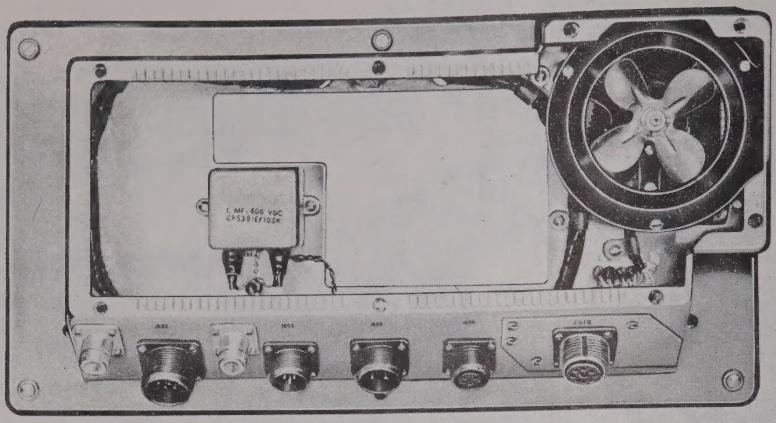


Figure 1-7. Junction Box, Cover Removed

TABLE 1-1. RADIO RECEIVING SET AN/BRR-3, EQUIPMENT SUPPLIED

QUANT. PER EQUIP.	NOMENCLATURE		*OVERALL DIMENSIONS			*VOL	*WT.
	NAME	DESIGNATION	H	W	D		
1	Radio Receiver	R988/BRR-3	8-3/4	17-1/4	20	1.8	85
1	Set of connectors and clamps consisting of:						
	1 Connector	AN3106A-18-1S					
	1 Connector	AN3106A-14S-7S					
	1 Connector	AN3106A-16S-4S					
	1 Connector	AN3106A-14S-7P					
	2 Clamps	AN3057-6					
	1 Clamp	AN3057-8					
	1 Clamp	AN3057-10					
	2 Connectors	UG-21/U					
	1 Connector	UG-941/U					
	1 Connector	MS3106A-22-27P					
	1 Clamp	AN3507-12B					
2	Bracket, angle, relay rack mounting	None	7-11/16	1	13	0.58	1-7/8
4	Shock mounts	None	1-1/16	2-3/8	2-3/8	0.006	1-1/2

* Unless otherwise stated, dimensions are in inches, volume in cubic feet, weight in pounds.

TABLE 1-1A. RADIO RECEIVING SET AN/BRR-3, FIELD CHANGES

FIELD CHANGE NUMBER	FIELD CHANGE TITLE AND PURPOSE	SERIAL NUMBERS OF EQUIPMENTS AFFECTED (ALL NUMBERS INCLUSIVE)	FIELD CHANGE ACCOMPLISHED
Change 1	Replacing connectors J607 through J610 with connector J618.	Up to and including NObsr 85101-B99.	Connector J618 is installed.

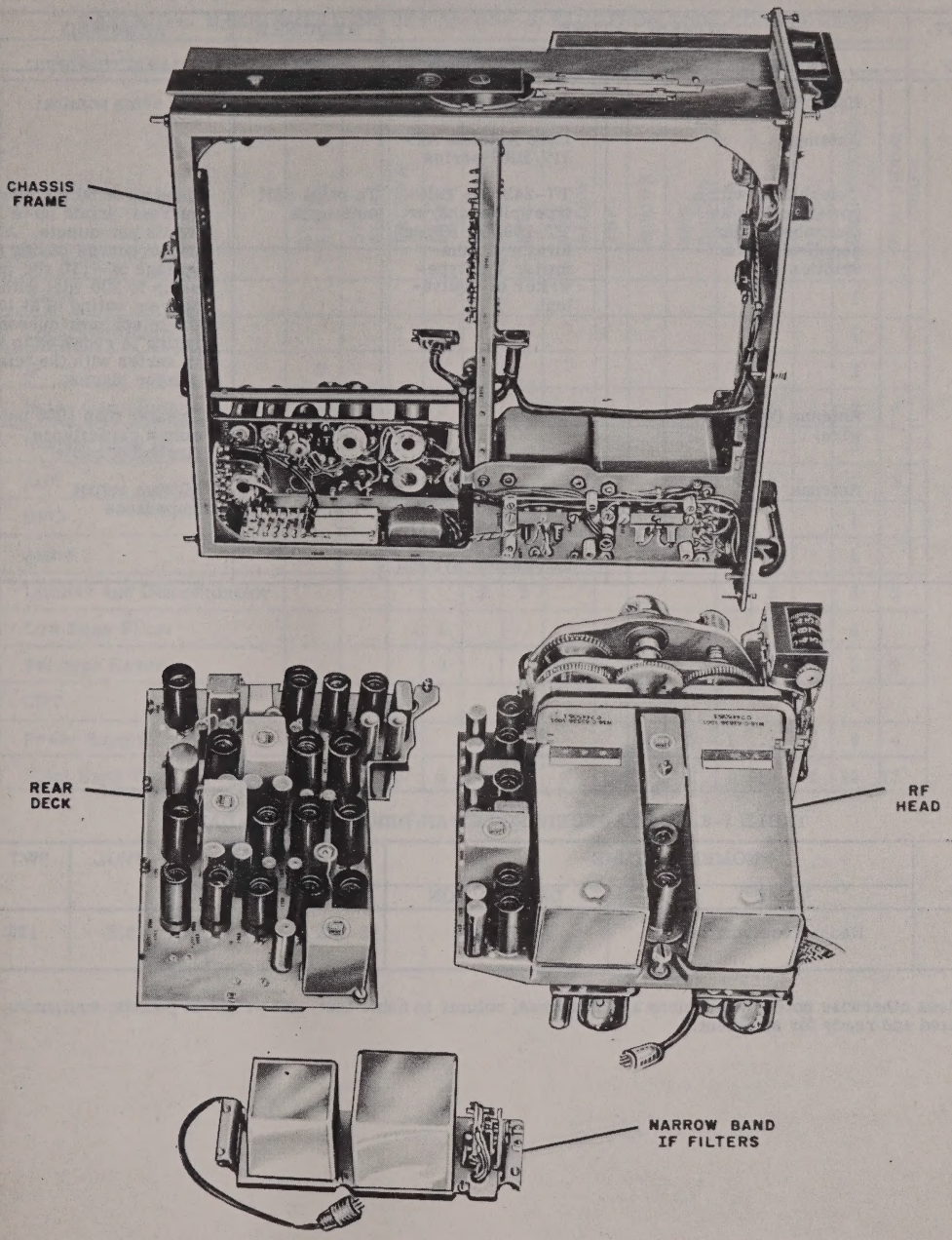


Figure 1-8. Receiver Chassis Subassemblies

TABLE 1-2. RADIO RECEIVING SET AN/BRR-3, EQUIPMENT REQUIRED BUT NOT SUPPLIED

QUANT. PER EQUIP.	NOMENCLATURE		REQUIRED USE	REQUIRED CHARACTERISTIC
	NAME	DESIGNATION		
1	Headphone	49507 or equivalent		600 ohms nominal
1	Antenna	Loop Antenna AT-317/BRR series		
1	Teleprinter with a power source as described under required characteristics	TT-242/UG Teletypewriter and/or TT-159/UG Reperforator-Transmitter Teletypewriter or equivalent	To print FSK messages	Uses up to 60 ma magnet current; prints up to 60 words per minute. A power source having a voltage of +110 vdc (may be up to 200 vdc) with a current rating of at least the teleprinter current rating is required to be in series with the teleprinter magnet.
1	Antenna (whip or wire)			Greater than 1000 uuf output capacitance (including cable)
1	Antenna	Antenna Group AN/BRA-7 (XN-1), AN/BRA-8(XN-1), or any 50 ohm output antenna system		50 ohm output impedance

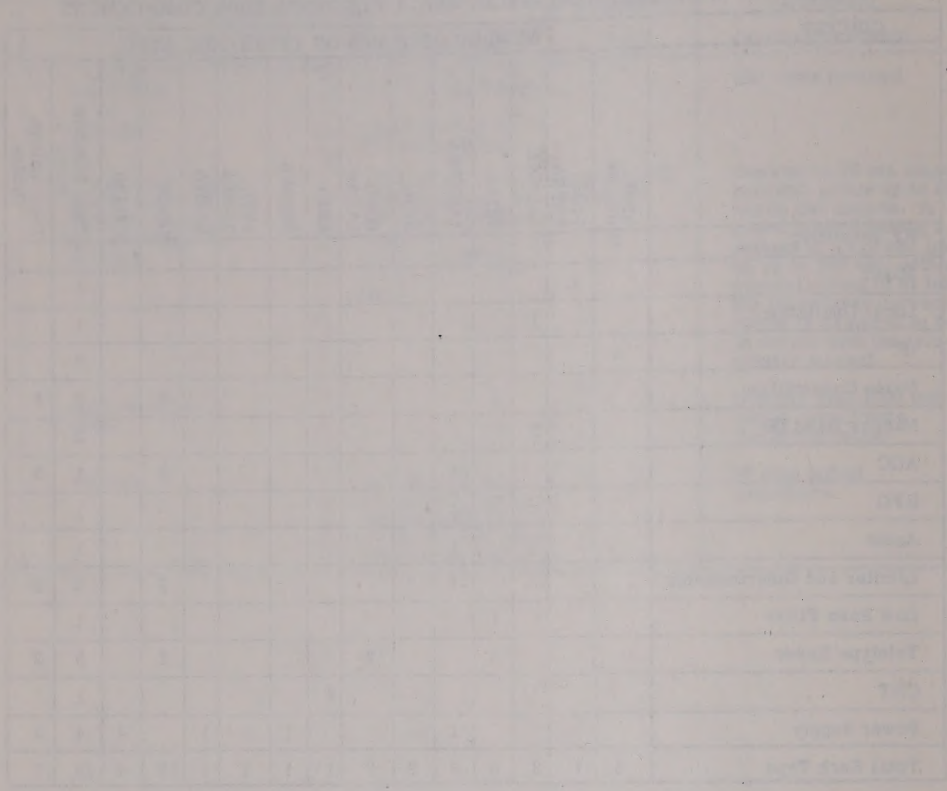
TABLE 1-3. RADIO RECEIVING SET AN/BRR-3, SHIPPING DATA

BOX NO.	NOMENCLATURE		*OVERALL DIMENSIONS			*VOL.	*WT.
	NAME	DESIGNATION	H	W	D		
1	Radio Receiving Set	AN/BRR-3	15-1/2	22	27	5.3	125

* Unless otherwise noted, dimensions are in inches, volume in cubic feet, and weight in pounds; equipment crated and ready for shipment.

TABLE 1-4. RADIO RECEIVING SET AN/BRR-3, ELECTRON TUBE COMPLEMENT

CIRCUIT	NUMBER OF TUBES OF TYPES INDICATED															
	5749/ 6BA6W	5750/ 6BE6W	6AU6WA	5814A	12AT7WA	5751	6005/ 6AQ5W	2BP1	6080WA	6627/ 0B2WA	0A2WA	1N459	1N1130	Total Electron Tubes	Total Silicon Diodes
RF Amplifier	3													3	
Mixer		1												1	
Local Oscillator			1											1	
IF	3													3	
Noise Cancellation				2								6		2	6
Narrow Band IF			2											2	
AGC					1							3		1	3
BFO					1									1	
Audio					1									1	
Limiter and Discriminator					1	2						2		3	2
Low Pass Filter				1										1	
Teletype Keyer				3			2					2		5	2
CRT								1						1	
Power Supply					1				1	1	1		4	4	4
Total Each Type	6	1	3	6	5	2	2	1	1	1	1	13	4	29	17



SECTION 2

INSTALLATION

2-1. UNPACKING AND HANDLING.

Radio Receiving Set AN/BRR-3 (the receiver) is a delicate electronic unit which weighs 85 pounds. Careful handling and unpacking of the receiver is essential. Do not drop the shipping crate or thrust pinch bars or other tools into it while unpacking the receiver.

To avoid excessive handling, the receiver should be uncrated as near the point of installation as practical. It is recommended that the receiver shall not be removed from the shipping container until all is ready for installation.

To unpack the receiver, proceed as follows:

Step 1. Remove nails from top cover of shipping container and remove cover.

Step 2. Remove accessories from side of receiver.

Step 3. Lift receiver from shipping container (two men should perform this step).

NOTE

The receiver is not bolted to the shipping container.

Inspect the receiver for dents, damaged dials or indicators, etc. Then check equipment received using table 1-1 as a guide.

2-2. MOUNTING LOCATION.

The receiver is housed in a cabinet designed primarily for table top installation, with (preferred) or without shock mounts. Brackets are provided, however, for mounting the receiver on a relay rack.

2-3. POWER REQUIREMENTS AND DISTRIBUTION.

The receiver requires a primary power source of 105 to 125 vac, 50 to 60 cps, single phase, and 120 watts. See figure 5-26 for primary power distribution. See paragraph 2-6 for power transformer primary winding tap adjustments.

2-4. INSTALLATION LAYOUT.

In any installation, whether table top or relay rack, it is important that sufficient clearances are provided for servicing the equipment and for adequate air circulation. In choosing the mounting site, the following clearance factors must be considered: First, volume clearance in front of the receiver to accommodate the extension and rotation of the receiver chassis in all servicing positions; second, clearance in back of and under the receiver to accommodate all connectors and cabling; and third, clearance on the right side and rear of the receiver to permit unobstructed circulation of air for proper operation of the internal blower.

a. TABLE TOP MOUNTING WITH SHOCK MOUNTS. (See figures 2-1 and 2-2.) - To install the receiver with shock mounts on a table top, proceed as follows:

CAUTION

The disassembly and reassembly of the receiver chassis and the cabinet will always be performed by two men.

Step 1. Select a temporary clear, flat area, 20 inches wide and 50 inches long (preferably a clear floor area). Locate the receiver on this area so that there is sufficient clearance in front of the receiver to fully extend the receiver chassis.

Step 2. Loosen the six quarter turn fasteners on the front panel. Hold the rear of the cabinet to the floor and fully pull the receiver chassis carefully from the cabinet until stop latch buttons engage. The receiver chassis will extend on slides until its rear is 3-3/4 inches beyond the front of the cabinet.

CAUTION

The cabinet is not yet secured. Keep a firm control of the extended receiver chassis at all times.

Step 3. Note the positions of the interconnecting cables (see figure 2-3(1)) and the interconnecting cable clamps (3) on the rear of the chassis frame since they must be returned to the exact position on reassembly.

Step 4. Loosen the two cable clamps from the chassis frame. Each cable clamp is secured by two quarter turn fasteners (2). Do not loosen the cable tie at the rear of the connector plugs, P617(5) and P611(9).

Step 5. Disconnect the two interconnecting cable connector plugs from the connector receptacles, J617(8) and J611(10), on the chassis frame. These plugs are removed by grasping the connector ring (7) and pulling outward.

Step 6. Place the loose cables in the cabinet.

Step 7. Remove the receiver chassis from the extended slides. In order to do this, each man must grasp a front handle with one hand and hold the receiver chassis in a horizontal position. Next they must take firm hold of the rear side of the chassis frame with their other hand, press the two stop latch buttons (see figure 2-4(3)) on the slide assembly, and pull the receiver chassis free from the intermediary slide (2). Then they set the receiver chassis in a protected, safe place on the right side (crt side down). (See figure 6-5.)

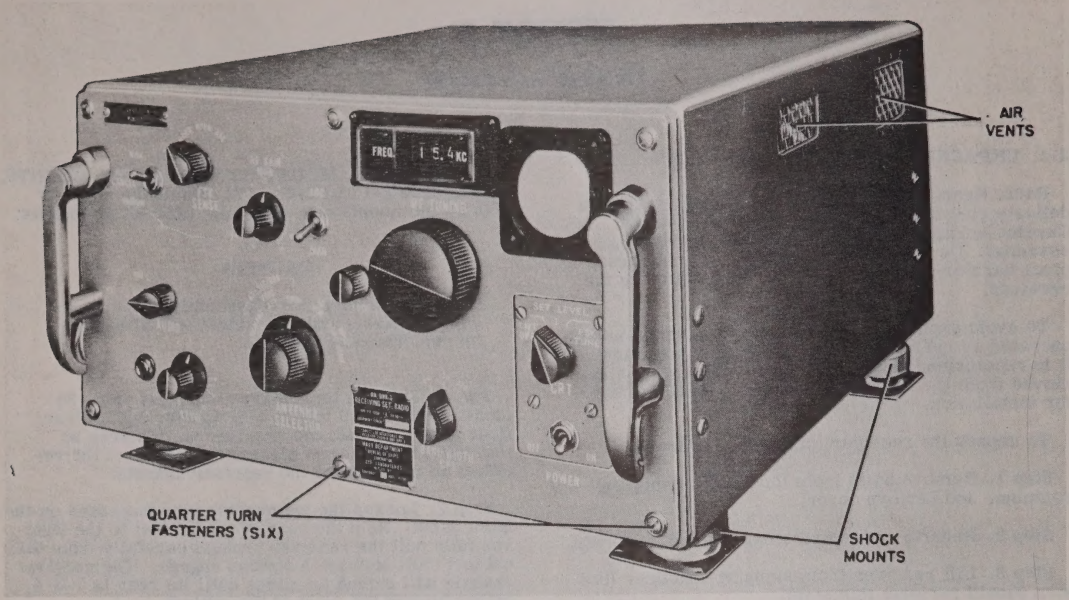


Figure 2-1. Receiver with Shock Mounts

CAUTION

Never set the receiver chassis down in any other position because this could cause damage to the equipment.

Step 8. Push the extended slide assemblies into the cabinet.

Step 9. Place the cabinet on the designated area. Make sure that there will be sufficient vertical clearance for the cabinet when the shock mounts are attached.

Step 10. With the cabinet in its exact designated position, scribe four locating circles on the table top through the holes in the cabinet mounting bars (see figure 2-2). These mounting bars are located on the inside bottom of the cabinet (see figure 2-5(4)). Also, select a convenient location and drill a 1/4-inch hole for a heavy grounding strap to be run from ground to the screw holes located on the sides (near the front) of the cabinet.

Step 11. Make a template using the pattern in figure 2-6.

Step 12. With the center of the template coincident with the center of the locating circle and the shock mount mounting holes parallel with the front and side of the receiver (see figure 2-2), mark the center of the shock mount mounting holes with a center punch. This step will be repeated at the other three locating circles.

Step 13. Drill sixteen 1/4-inch holes in the table top at the 16 centerpunched locations and fasten the shock mounts to the table top with sixteen 3/16-inch bolts, nuts, and lockwashers. Use bolts 1/2 inch (plus the thickness of the table top) in length. The bolts, nuts, and lockwashers are not supplied with the equipment.

Step 14. At installations where the junction box will not be accessible after the cabinet is secured, support the cabinet on the edge of the table and connect the power and auxiliary equipment cable plugs to the appropriate connector receptacles on the junction box (see figure 2-7). At installations where the junction box will be accessible after the cabinet is secured, connect the cables to the receptacles on the junction box at the end of the installation of the receiver.

Step 15. Fasten the heavy ground strap between ground and cabinet. Use a 10-32 binding head screw, 3/8 inch (plus the thickness of the ground strap) in length, to fasten the ground strap to the cabinet.

Step 16. Place the cabinet on the shock mounts. If the cables have been connected to the junction box in step 14, make sure that the cables do not snag or twist when the cabinet is pushed into position.

Step 17. Fasten the cabinet to the shock mounts using the 1/4-inch machine screws supplied with the equipment.

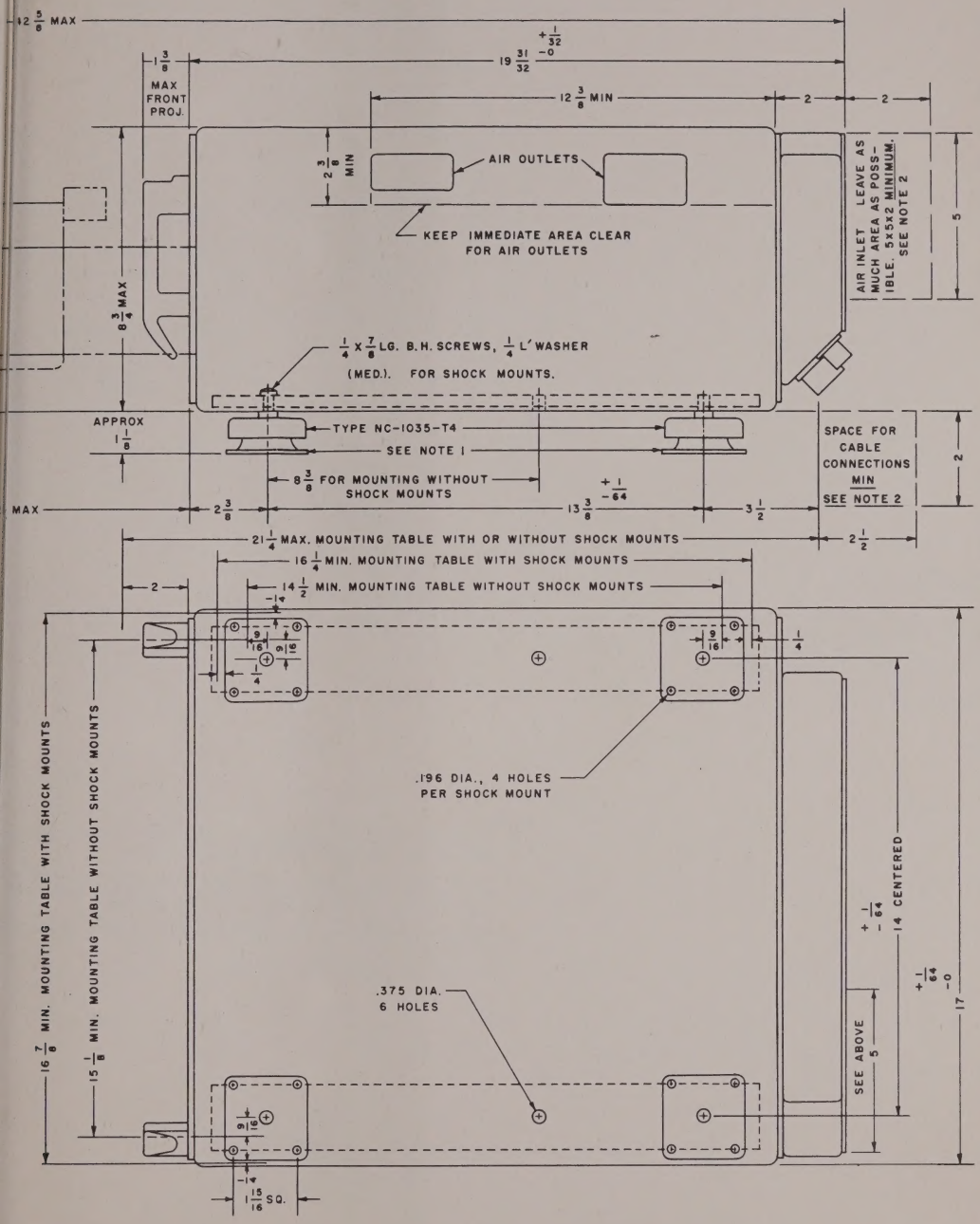


Figure 2-2. Radio Receiving Set AN/BRR-3 Table Top Mounting, Outline Drawing

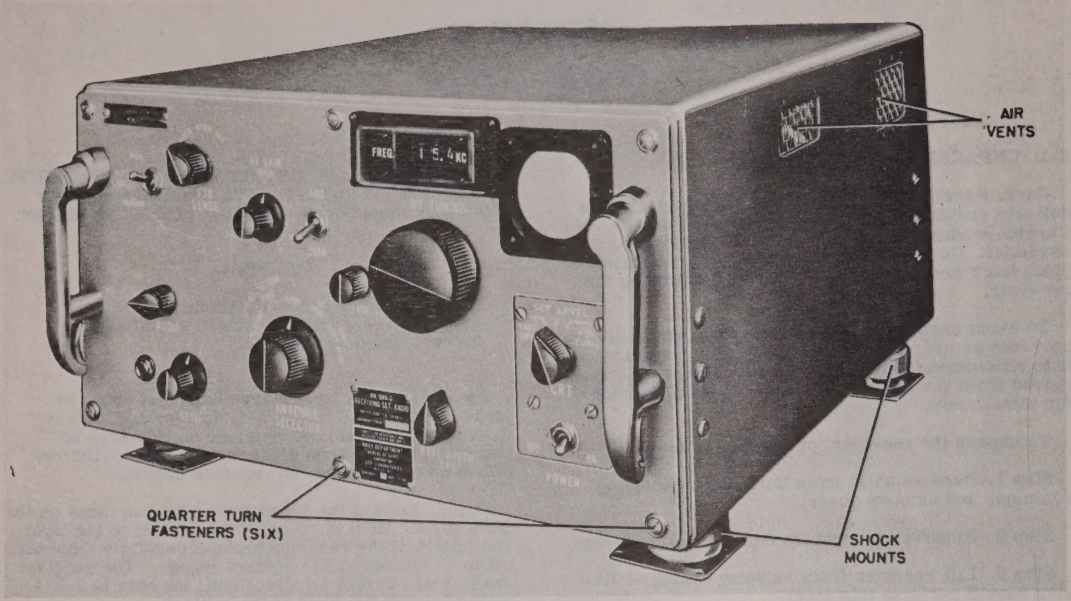


Figure 2-1. Receiver with Shock Mounts

CAUTION

Never set the receiver chassis down in any other position because this could cause damage to the equipment.

Step 8. Push the extended slide assemblies into the cabinet.

Step 9. Place the cabinet on the designated area. Make sure that there will be sufficient vertical clearance for the cabinet when the shock mounts are attached.

Step 10. With the cabinet in its exact designated position, scribe four locating circles on the table top through the holes in the cabinet mounting bars (see figure 2-2). These mounting bars are located on the inside bottom of the cabinet (see figure 2-5(4)). Also, select a convenient location and drill a 1/4-inch hole for a heavy grounding strap to be run from ground to the screw holes located on the sides (near the front) of the cabinet.

Step 11. Make a template using the pattern in figure 2-6.

Step 12. With the center of the template coincident with the center of the locating circle and the shock mount mounting holes parallel with the front and side of the receiver (see figure 2-2), mark the center of the shock mount mounting holes with a center punch. This step will be repeated at the other three locating circles.

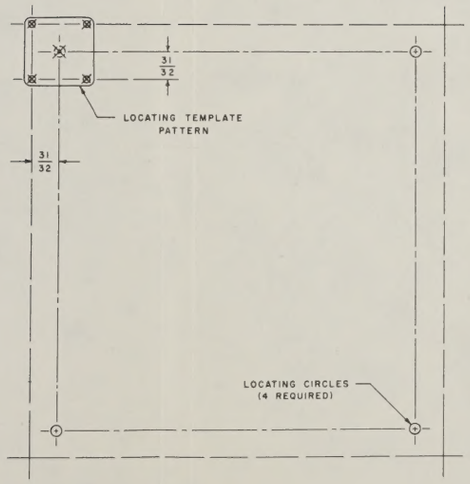
Step 13. Drill sixteen 1/4-inch holes in the table top at the 16 centerpunched locations and fasten the shock mounts to the table top with sixteen 3/16-inch bolts, nuts, and lockwashers. Use bolts 1/2 inch (plus the thickness of the table top) in length. The bolts, nuts, and lockwashers are not supplied with the equipment.

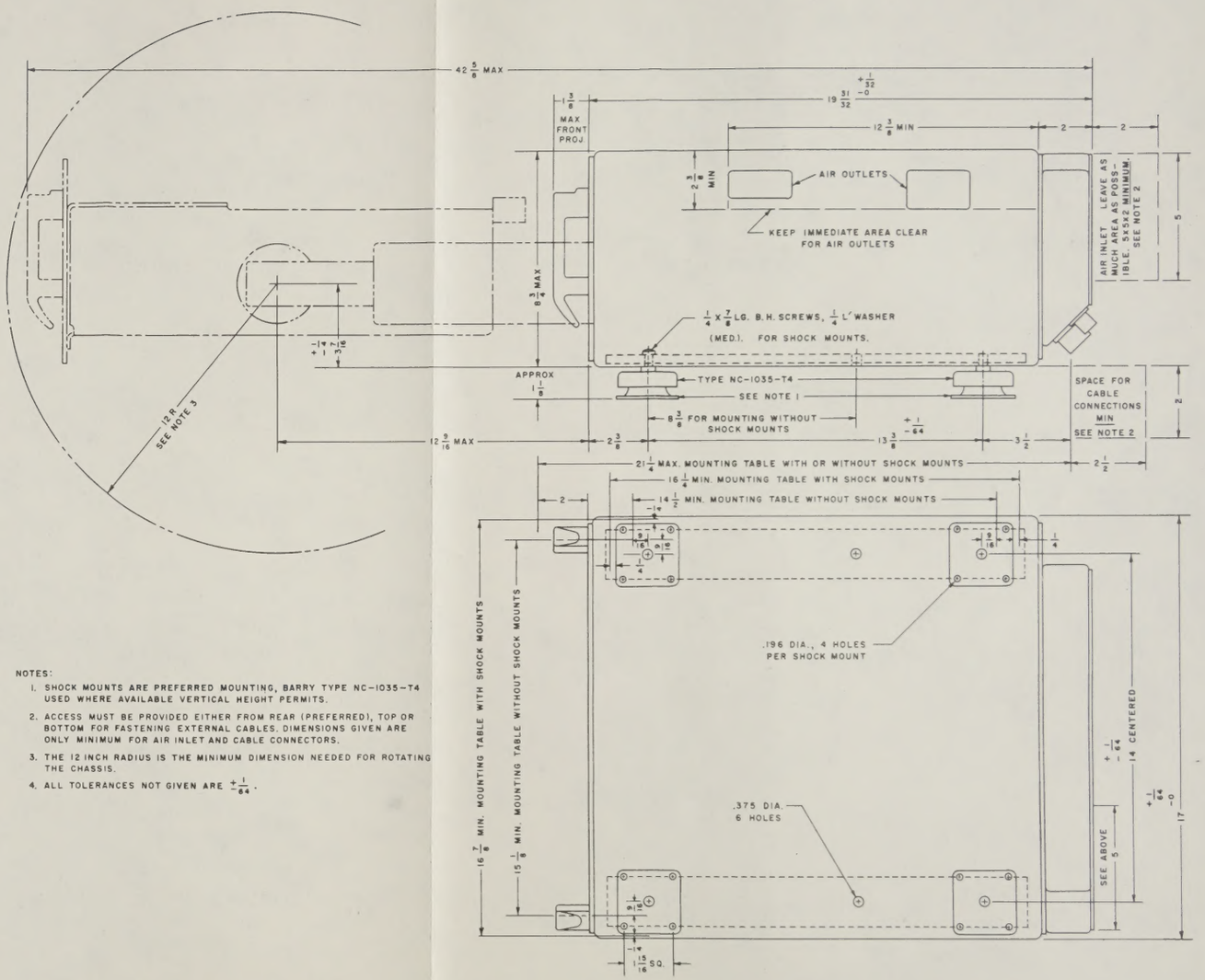
Step 14. At installations where the junction box will not be accessible after the cabinet is secured, support the cabinet on the edge of the table and connect the power and auxiliary equipment cable plugs to the appropriate connector receptacles on the junction box (see figure 2-7). At installations where the junction box will be accessible after the cabinet is secured, connect the cables to the receptacles on the junction box at the end of the installation of the receiver.

Step 15. Fasten the heavy ground strap between ground and cabinet. Use a 10-32 binding head screw, 3/8 inch (plus the thickness of the ground strap) in length, to fasten the ground strap to the cabinet.

Step 16. Place the cabinet on the shock mounts. If the cables have been connected to the junction box in step 14, make sure that the cables do not snag or twist when the cabinet is pushed into position.

Step 17. Fasten the cabinet to the shock mounts using the 1/4-inch machine screws supplied with the equipment.





NOTES:

1. SHOCK MOUNTS ARE PREFERRED MOUNTING, BARRY TYPE NC-1035-T4 USED WHERE AVAILABLE VERTICAL HEIGHT PERMITS.
2. ACCESS MUST BE PROVIDED EITHER FROM REAR (PREFERRED), TOP OR BOTTOM FOR FASTENING EXTERNAL CABLES. DIMENSIONS GIVEN ARE ONLY MINIMUM FOR AIR INLET AND CABLE CONNECTORS.
3. THE 12 INCH RADIUS IS THE MINIMUM DIMENSION NEEDED FOR ROTATING THE CHASSIS.
4. ALL TOLERANCES NOT GIVEN ARE $\pm\frac{1}{64}$.

Figure 2-2. Radio Receiving Set AN/BRR-3 Table Top Mounting, Outline Drawing

1. INTERCONNECTING CABLES
2. QUARTER TURN FASTENERS
3. INTERCONNECTING CABLE CLAMPS
4. CABLE TIES
5. P617
6. ORANGE BAND
7. CONNECTOR PLUG RING
8. J617
9. J611
10. P611

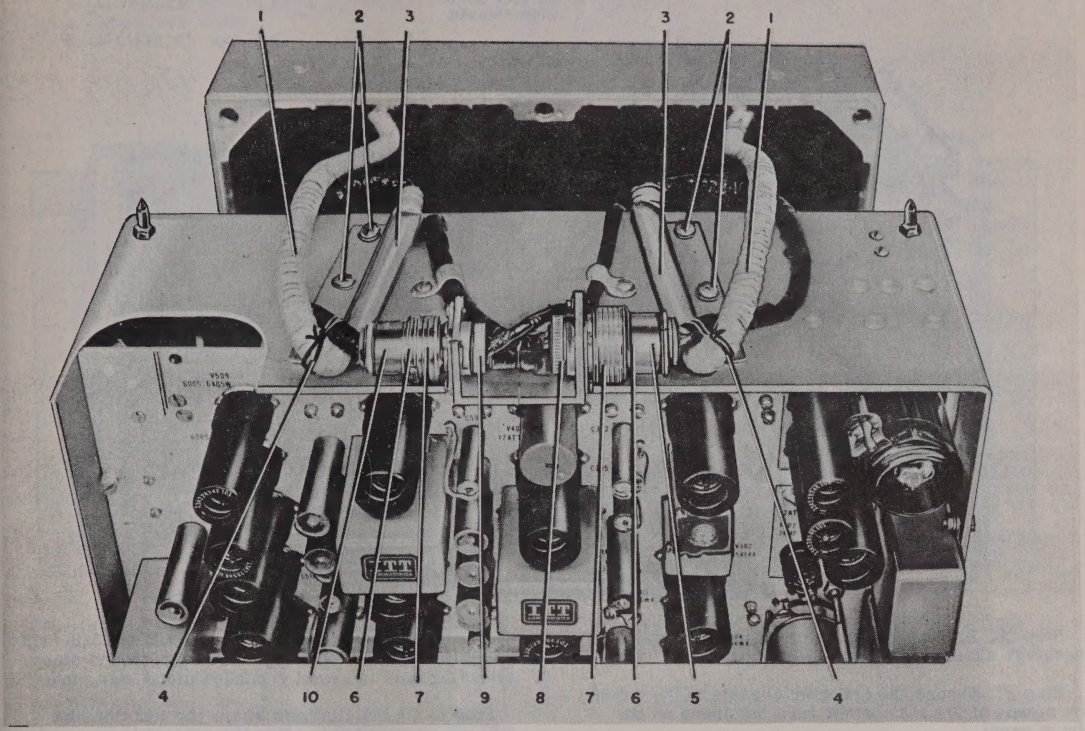


Figure 2-3. Receiver Chassis, Cable and Clamp Detail

Step 18. Extend the slide assemblies from the cabinet. It will be necessary to press the automatic stop latch buttons (see figure 2-5(3)) on the slide assemblies.

Step 19. With two men handling the receiver chassis, reassemble the receiver by mating the chassis section (see figure 2-4(1)) of the slide assemblies on each side of the chassis frame with the respective intermediary slide (2) extended from the cabinet assembly.

Step 20. Press the stop latch buttons (3) on the chassis frame and slide the receiver chassis into the extended intermediary slides until the buttons engage in the slots (4).

Step 21. Withdraw the two cables from the cabinet and allow them to hang free from the front of the cabinet assembly. Tilt the chassis frame to a 45 degree position, front down. This is accomplished by pressing the latch triggers (see figure 2-4(7)) located under the bottom of each front handle (1). Release the triggers when the receiver chassis is in the approximate desired rotational position. Continue rotating the receiver chassis until it locks in the desired position.

Step 22. Bring the free ends of the cables up behind the receiver chassis without twisting or turning them so that they are in the same position as noted in step 3 above.

Step 23. Connect the cables to the receiver chassis. This is accomplished by grasping the body of the connector plug, mating the keyway of the connector plug with the key of the connector receptacle, and pushing until a click is heard or felt and the orange band (see figure 2-3(6)) around the connector plug is visible. If difficulty is encountered, check that the ring is in the correct premating position, that is, with the orange band covered.

Step 24. Secure the cable clamps to the chassis frame by means of the quarter turn fasteners (two fasteners per clamp).

Step 25. Rotate the chassis frame to the horizontal position.

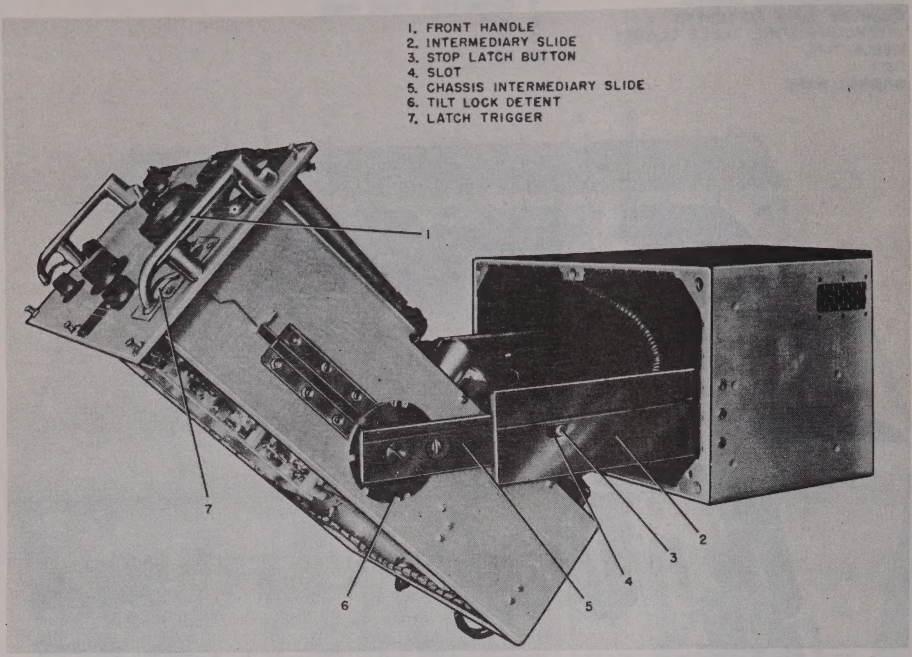


Figure 2-4. Receiver, Slide Assembly Detail

Step 26. Press the stop latch buttons and push the receiver chassis back into the cabinet.

Step 27. Secure the receiver chassis in the cabinet by means of the six quarter turn fasteners on the front panel.

Step 28. Connect the ground strap power plug and the auxiliary equipment cable plugs to the appropriate receptacles if this has not been done in step 14.

b. TABLE TOP MOUNTING WITHOUT SHOCK MOUNTS. (See figure 2-2.) - The receiver may be mounted on the table top without shock mounts if vertical clearance of the available space will not permit their use. Particular attention must be given to the clearance behind the junction box. A recess or cutout must be provided in the table top to accommodate the cable connector plugs and the cable turns. In order to mount the receiver without shock mounts, proceed as follows:

Step 1. Perform steps 1 through 8, paragraph 2-4a.

Step 2. Place the cabinet exactly in its designated position and scribe six locating circles on the table top through the holes in the cabinet mounting bars (see figure 2-5(4)). These mounting bars are located on the inside bottom of the cabinet. If the table top is not a metal surface firmly grounded to the ship's hull, select a convenient location on a well grounded metal structure and connect a heavy ground strap between ground and screw holes located on the sides (near the front) of the cabinet.

Step 3. Remove the cabinet and drill six 3/8-inch holes through the table top. Drill the ground strap mounting hole in a well grounded metal structure.

Step 4. At installations where the junction box will not be accessible after the cabinet is secured, support the cabinet on the edge of the table and connect the power plug and the auxiliary equipment cable plugs to the appropriate receptacles on the junction box. At installations where the junction box will be accessible after the cabinet is secured, the ground strap, the power plug, and the auxiliary equipment cable plugs will be connected at the end of the installation of the receiver. See paragraph 2-5 for installation of auxiliary equipment. If necessary, fasten the ground strap to the cabinet with a 10-32 binding head screw, 3/8 inch (plus the thickness of the ground strap) in length.

Step 5. Place the cabinet in its designated position. If the cables have been connected to the cabinet in step 4, make sure that the cables feed smoothly into the recess or cutout without snagging or twisting when the cabinet is pushed into position.

Step 6. Secure the cabinet to the table top with six 5/16-inch diameter bolts, 1 inch (plus the thickness of the table top) in length. These fasteners (six nuts, bolts, and lockwashers) are not supplied with the equipment and must be procured. Install with the bolt heads inside the cabinet.

Step 7. Perform steps 18 through 28, paragraph 2-4a.

1. INTERCONNECTING CABLE GUIDE CONE (MP620)
2. BLOWER MOTOR
3. AUTOMATIC STOP LATCH BUTTONS
4. MOUNTING BARS
5. AIR FILTER HANDLE

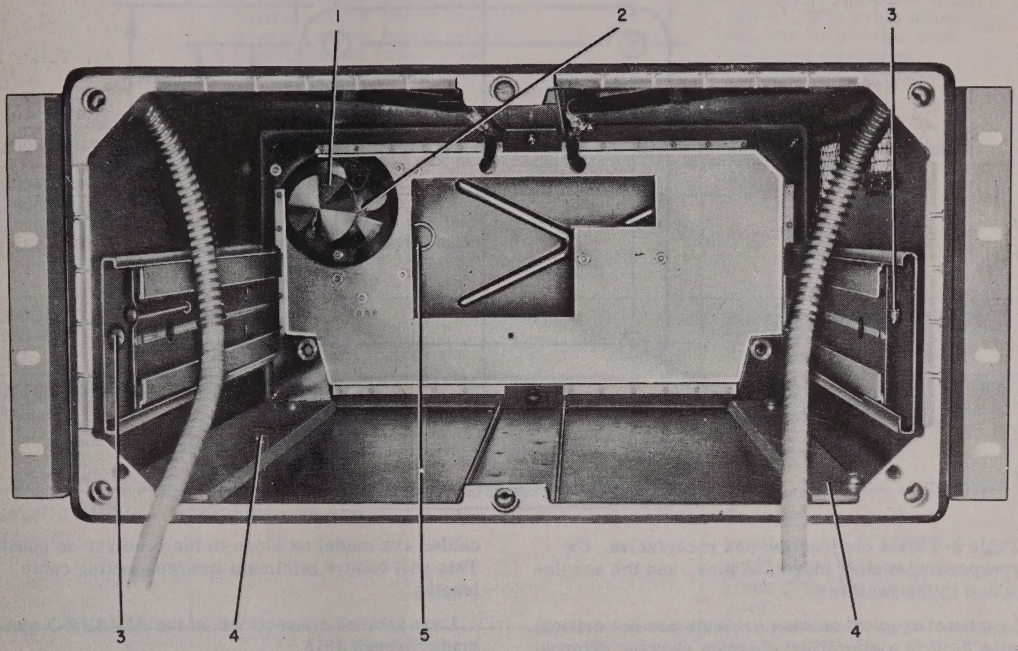


Figure 2-5. Cabinet Interior

c. RELAY RACK MOUNTING. (See figures 2-8 and 2-9.) - The receiver requires 8-3/4 inches of panel space on the standard 19 inch relay rack. All clearance requirements must be met. See figure 2-2 for minimum clearances. In order to mount the receiver on a relay rack, proceed in the following manner:

Step 1. Perform steps 1 through 8, paragraph 2-4a.

Step 2. Fasten the mounting brackets to the cabinet, one on each side of the cabinet. Use six 10-32 flat head screws, 3/8 inch long.

Step 3. Fasten the cabinet on the relay rack frame. Four holes per bracket are provided for this purpose. Use machine screws standard for the relay rack of the particular installation.

Step 4. Perform steps 18 through 28, paragraph 2-4a.

2-5. INSTALLATION REQUIREMENTS.

Interconnecting cable and conductors will vary among installations. Refer to the applicable ship or station plan to determine the correct cabling for a specific installation. All wiring used in cable interconnections shall be 24 AWG minimum, except primary power connections which shall be 16 AWG minimum.

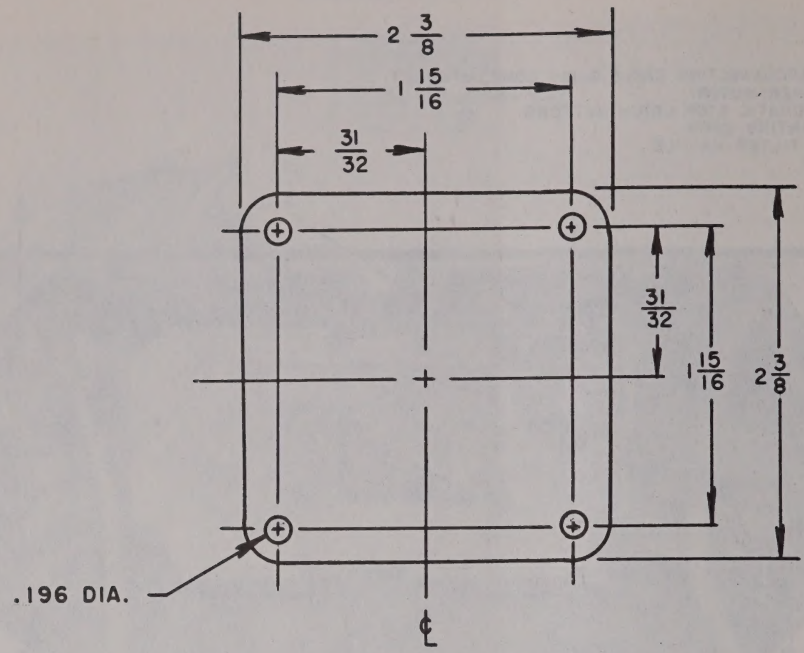


Figure 2-6. Template Pattern

Table 2-1 lists the junction box receptacles, the corresponding mating plugs and pins, and the service supplied to the receiver.

Lengths of external antenna cablings are not critical. Figure 2-10 is a simplified diagram showing external connections for the teletype loop and various versions of the Loop Antenna AT-317/BRR series. Figure 2-7 shows the rear of the cabinet, the junction box, and connector detail. The minimum auxiliary equipment necessary to operate the receiver is one antenna, one headphone, and one primary power connection to J605.

a. LOOP ANTENNA AT-317/BRR SERIES. (See figure 2-10.) - The receiver is designed for use with AT-317/BRR series loop antennas. Electrically, all of the AT-317/BRR series loop antennas are essentially identical; the difference is the type of cable used to connect the antenna to a receiver. AT-317B/U uses cable RG-264/U, which has four coaxial cables covered by a common shield. Table 2-2 lists the cables commonly encountered in AT-317/BRR antenna installations with a brief description of each.

Locate all patch panels (in which connections between the antenna cable and the interconnecting cables are made) as close to the receiver as possible. This will ensure minimum interconnecting cable lengths.

Loop antenna connections on the AN/BRR-3 are made through J618.

In each installation, a patch panel is used. See figure 2-10 for the installation requirements between the antenna cable used and the connectors on the AN/BRR-3 receiver.

NOTE

For AT-317/BRR operation, it is mandatory that connections are made to each of the four loop antenna inputs. These four leads are pins A, E (Athwart) and C, G (Fore-Aft) on J618.

When a 2-conductor antenna cable is used, the two "extra" conductors (one of each pair) must be connected to ground in accordance with the applicable detail of figure 2-10. Note that two shielded pairs are used so that the ground connection is made through the antenna system ground only.

TABLE 2-1. EXTERNAL CONNECTIONS

CONNECTOR RECEPTACLE	MATING CONNECTOR PLUG (AND PINS)	SERVICE REQUIRED
J601 (UG-58A/U)	UG-21/U with RG-214/U cable (formerly RG-9/U)	Connect to output of whip or wire antenna.
J602(AN3102A-18-1P)	AN3106A-18-1S A-Synchro stator (white red) B-Synchro stator (white orange) C-Synchro stator (white yellow) E-Synchro rotor (white blue) F-Synchro rotor (white gray) H-NOISE CANCEL switch (white brown) I-Ground (white black)	Connect to control unit of Antenna Group AN/BRA-7(XN-1) or AN/BRA-8 (XN-1). For cable drawing, see instruction book for above equipment.
J603(UG-58A/U)	UG-21/U with RG-214/U cable (formerly RG-9/U)	Connect to 50 ohm antenna.
J604(AN3102A-14S-7P)	AN3106A-14S-7S A-Connect to positive side of teleprinter loop and then to + 110 vdc (see figure 2-9). B-Grounded within receiver, connect to negative side of + 110 vdc.	Connect to teleprinter.
J605(AN3102A-16S-4P)	AN3106A-16S-4S A and B (Use #16 wire)	Power is from 105/115/125 vac, 50-60 cps.
J606(AN3102A-14S-7S)	AN3106A-14S-7P A-Audio output B-Low side of audio output (not connected to receiver ground)	Connect to either one or two 600-ohm headphones.
J618(MS3102A-22-27S)	MS3106A-22-27P	Connect, via patch panel, to AT-317/BRR series loop (see paragraph 2-5a and figure 2-10)

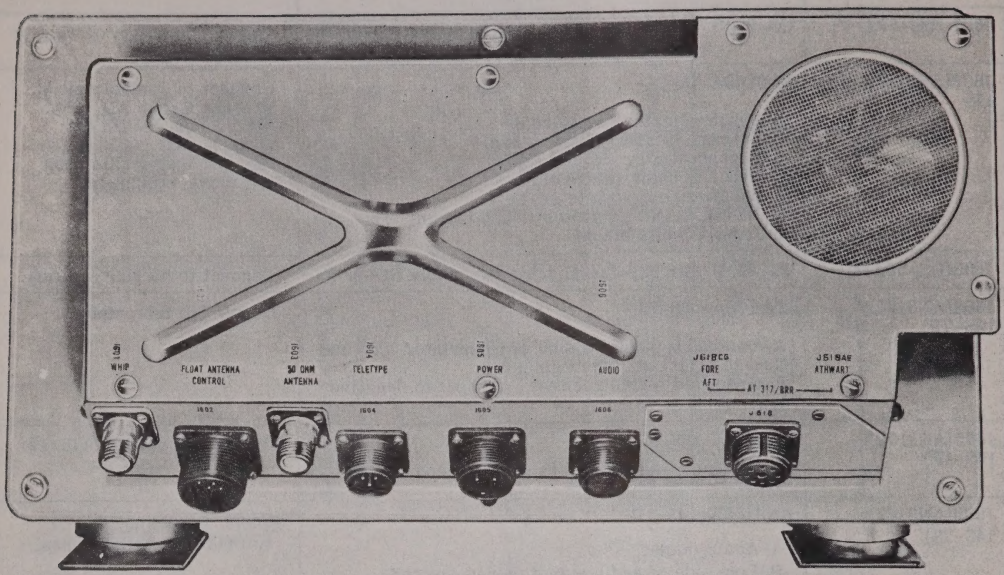


Figure 2-7. Receiver, Rear View

b. FIFTY OHM ANTENNA. - See table 2-1, connector J603.

c. WHIP ANTENNA. - See table 2-1, connector J601.

d. TELETYPEWRITER. - A 110 vdc supply must be connected in series with the teletypewriter loop. See figure 2-10 and table 2-1, connector J604.

2-6. INSPECTION AND ADJUSTMENTS.

a. INITIAL INSPECTION AND ADJUSTMENTS.

(1) ADJUSTMENT FOR LINE VOLTAGE. - The primary winding of power transformer T601 is provided with four taps. The receiver can, therefore, be accommodated to installations where the primary power is 105 to 125 vac. The receiver is shipped with the permanent power lead (gray wire) on terminal 1 and the adjusting leads (gray and white wires) on terminal 3. For installations where the primary power is 108 to 122 vac, no adjustment is necessary. The following terminals will be used wh the installation primary power falls within the indicated voltage ranges:

(a) Terminal 2 - 100 to 108 vac

(b) Terminal 3 - 108 to 122 vac

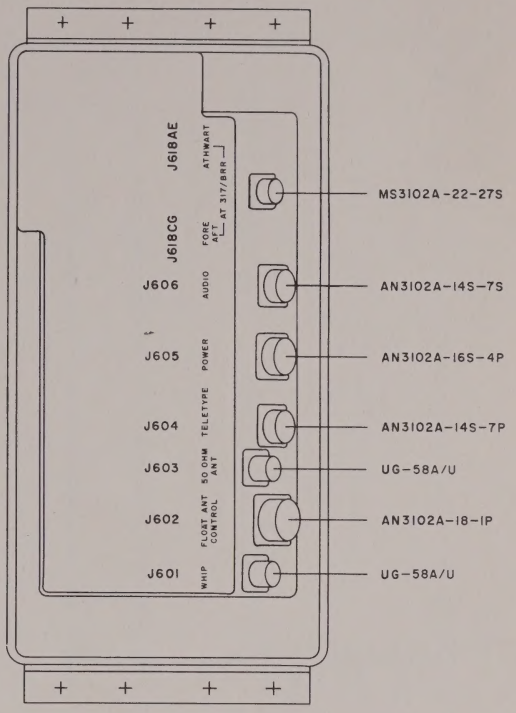
(c) Terminal 4 - 122 to 130 vac

Perform the following procedure when it is necessary to change taps on the power transformer (se figures 2-11 and 5-22 for transformer and terminal location).

Step 1. Set POWER switch to OFF. As an added safety precaution, remove both 2-amp fuses located on the chassis frame (see figure 2-12).

TABLE 2-2. ANTENNA CONNECTING CABLES

CABLE USED	DESCRIPTION	ADDITIONAL PATCH PANEL NEEDED
RG-264/U	4 Coaxial cables	Yes
RG-160/U	2 Coaxial cables	Yes
RG-57/U	2 Conductor twinax	Yes



REAR VIEW

LEARANCES FOR AIR INTAKE IN REAR AND FOR
IR OUTLET ON RIGHT HAND SIDE MUST BE
ROVIDED (SEE FIGURE 2-2)

RR-3 Relay Rack Mounted, Outline Drawing

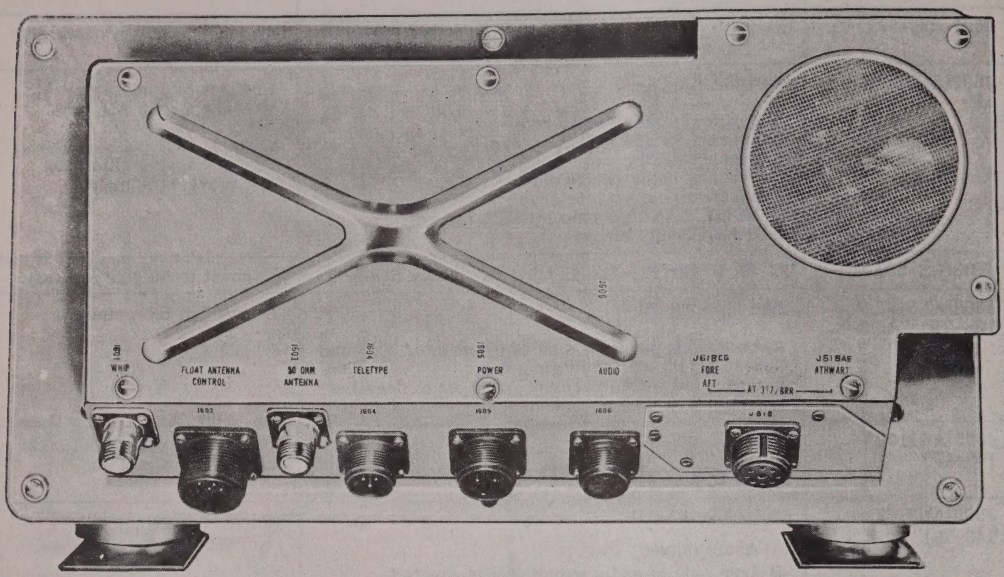


Figure 2-7. Receiver, Rear View

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c. WHIP ANTENNA. - See table 2-1, connector J601.

d. TELETYPEWRITER. - A 110 vdc supply must be connected in series with the teletypewriter loop. See figure 2-10 and table 2-1, connector J604.

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(a) Terminal 2 - 100 to 108 vac

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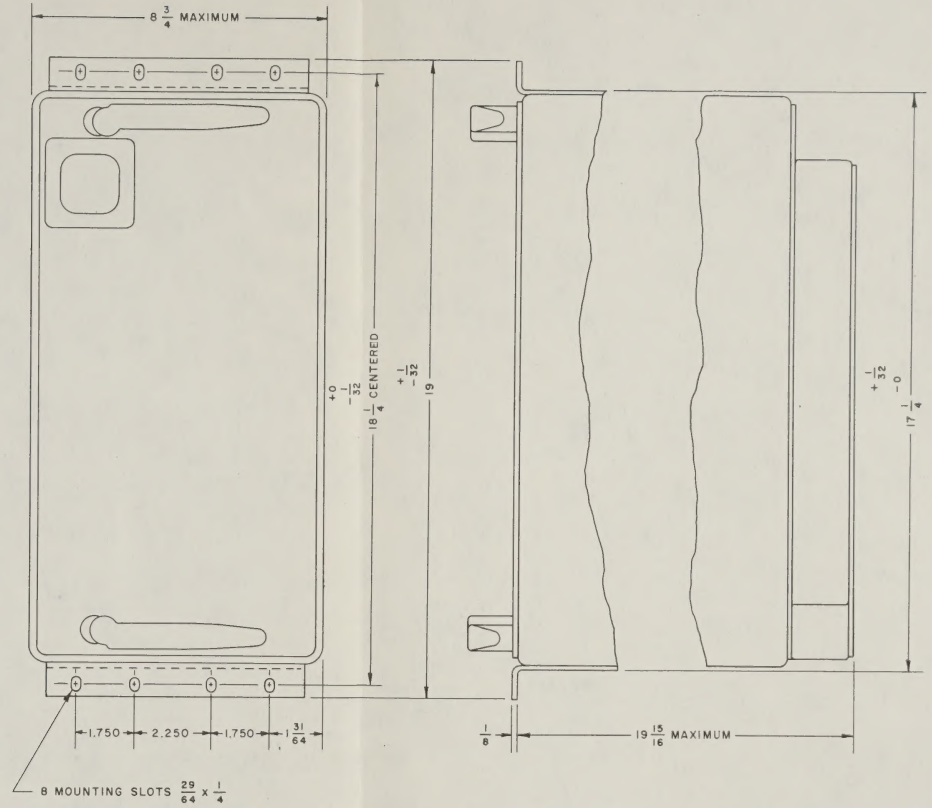
(c) Terminal 4 - 122 to 130 vac

Perform the following procedure when it is necessary to change taps on the power transformer (see figures 2-11 and 5-22 for transformer and terminal location).

Step 1. Set POWER switch to OFF. As an added safety precaution, remove both 2-amp fuses located on the chassis frame (see figure 2-12).

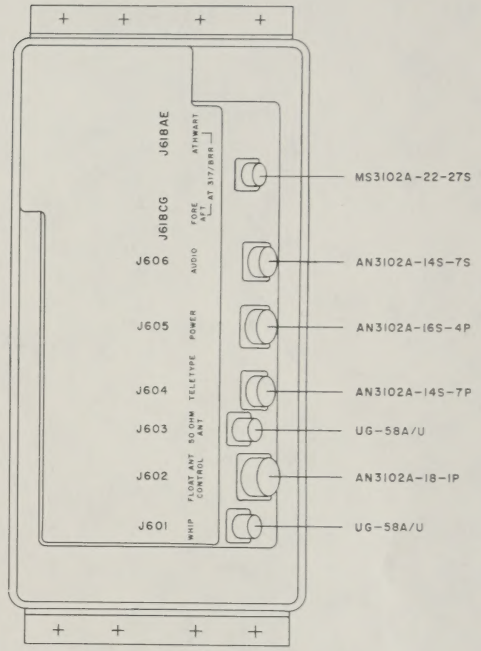
TABLE 2-2. ANTENNA CONNECTING CABLES

CABLE USED	DESCRIPTION	ADDITIONAL PATCH PANEL NEEDED
RG-264/U	4 Coaxial cables	Yes
RG-160/U	2 Coaxial cables	Yes
RG-57/U	2 Conductor twinax	Yes



FRONT VIEW

BOTTOM VIEW



REAR VIEW

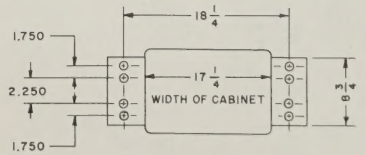
NOTES:

1. WEIGHT CRATED—125 LB. UNCRATED—85LB.
2. DIMENSIONS IN INCHES CRATED — 15 1/2 X 22 X 27
3. CUBIC CONTENTS — 1.85 CU. FT.
4. HEAT DISSIPATION IN WATTS — 120W
5. VACUUM TUBES:

1— 2BP1	6—5749/6BA6W
1— 6080WA	1—5750/6BE6W
1— 0A2WA	5—12AT7WA
3— 6AU6WA	2—6005/6AQ5W
6— 5814R	1—6627/0B2WA
2— 5751	

6. NOTES 2 & 3 OF FIG. 2-2 ALSO PERTAIN TO THIS INSTALLATION.

SPACE REQUIRED FOR RELAY RACK MOUNTING



CAUTION: CLEARANCES FOR AIR INTAKE IN REAR AND FOR AIR OUTLET ON RIGHT HAND SIDE MUST BE PROVIDED (SEE FIGURE 2-2)

Figure 2-8. Radio Receiving Set AN/BRR-3 Relay Rack Mounted, Outline Drawing

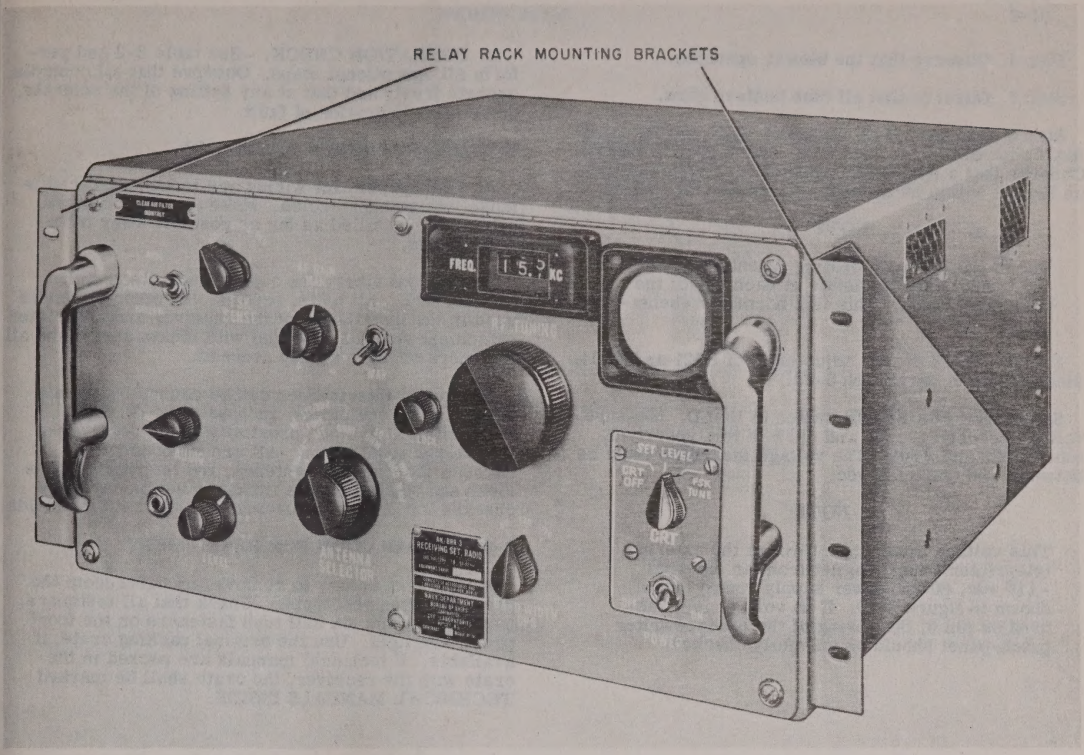


Figure 2-9. Receiver with Relay Rack Mounting Brackets

Step 2. Remove the lucite plate covering the power transformer. This plate is fastened to the transformer by six flat head screws.

Step 3. Unsolder only the heavy gray wire from terminal 3 and resolder it to the desired terminal of the power transformer.

NOTE

The thin gray wire on terminal 3 must remain on terminal 3.

Step 4. Replace the lucite plate.

Step 5. Replace the fuses.

(2) PHYSICAL INSPECTION. - Make sure there are no broken tubes, and each tube is seated properly in its socket. Observe that the air filter is secured properly and that the air vents on the rear and the right side of the cabinet have sufficient clearance for proper air vent operation (see figure 2-2).

(3) ELECTRICAL INSPECTION. - Inspect all connectors for proper mating and tightness. Ascertain that all ground connections are sound. Proceed with the following steps:

CAUTION

The following procedures will be performed only by technicians qualified to operate, maintain and repair this equipment. The receiver chassis will be extended from the cabinet and the equipment will be energized. Points where dangerous potentials exist will be exposed.

Step 1. Loosen the six half turn fasteners on the front panel and carefully pull the receiver chassis to its fully extended, horizontal position. Observe that the drawer slides work freely and that the stop latch buttons and the automatic stop latch buttons engage.

Step 2. Press the two latch triggers located under the lower portion of the front handles. Observe that the receiver chassis rotates freely in both directions and that the latch bolts (see figure 2-4(5)) engage in the slots of the tilt lock detent (6).

Step 3. Set POWER switch to ON. Observe that both panel lights are lit. Observe that there are no visible indications of malfunction of the equipment. If fault indications are observed, set POWER switch to OFF and refer to Section 5.

Step 4. Observe that the blower operates.

Step 5. Observe that all tube heaters glow.

Step 6. Set AGC-MAN switch to MAN, set RF GAIN MAN control to 0, and set CRT switch to SET LEVEL. Observe that a horizontal trace or a pattern appears on the crt within 30 seconds after power is applied.

NOTE

Due to the low accelerating potential on the crt, a spot may be visible at each end of the horizontal trace. This is a normal presentation.

Step 7. Check proper adjustment of R521 and R534. (See Section 6, paragraph 6-2d.)

Step 8. Set FSK SENSE switch to HOLD. Measure voltage between ground and pin 5 of teletypedriver tubes V508 and V509. The voltage measured must be between +60 and +110 vdc.

NOTE

This voltage must come through the external teleprinter keyer magnet from an external +110 vdc, 60 ma power supply connected as shown in figure 2-10. If no voltage is measured on pin 5, the wiring of the teletypewriter patch-panel should be carefully checked.

b. OPERATION CHECK. - See table 3-2 and perform all operational steps. Observe that all controls operate freely and that at any setting of the controls, there is no indication of fault.

2-7. INTERFERENCE REDUCTION.

At VLF, power line wiring can induce appreciable noise into antenna cables. Make sure that antenna cables are installed as far as possible away from power lines.

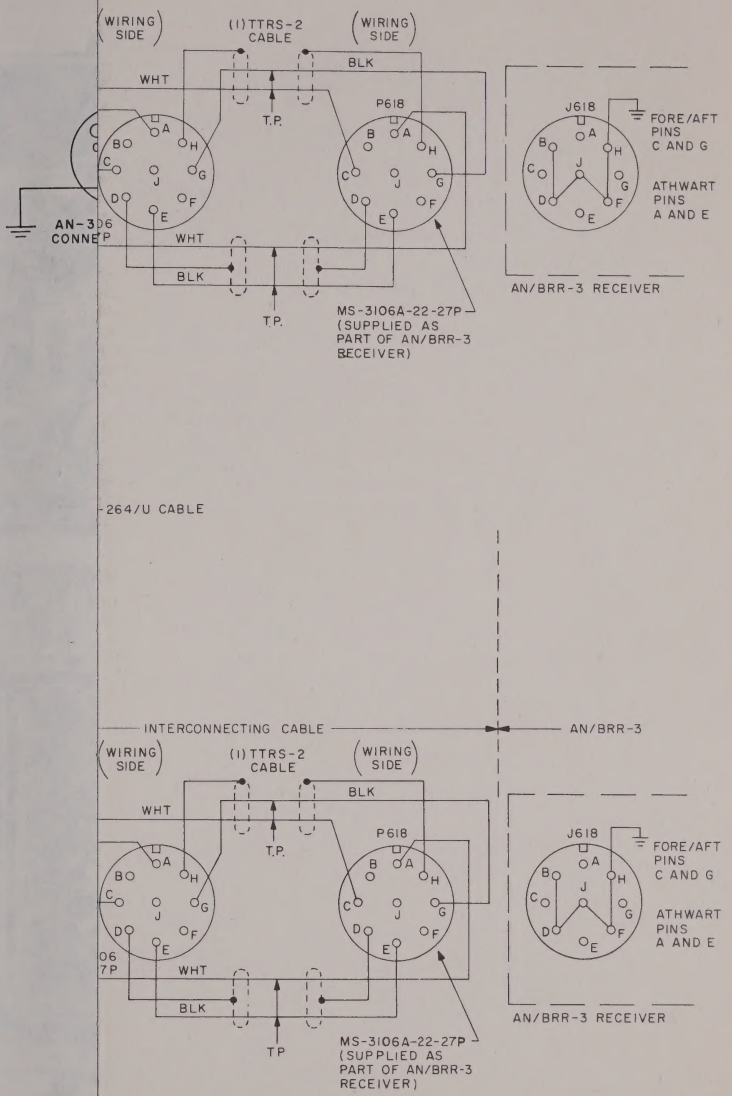
Mechanical vibrations can produce electrical interference. All bolts, screws, and other fasteners used in the installation of the receiver and associated equipment shall be provided with lockwashers, and all fasteners shall be tightly secured.

Electrical interference can be caused by signals generated by equipment, such as radio or radar transmitters, in close proximity to the receiver or its antenna installation. All ground connections between the receiver, antenna, and teletype must be clean and tight. Coaxial fittings must be carefully checked for proper grounding of coaxial cable shields.

2-8. PREPARATION FOR RESHIPMENT.

It is not necessary to remove any parts from the receiver when reshipping. Check that all fasteners, particularly the six half turn fasteners on the front panel, are tight. Use the original packing crate, if available. If technical manuals are packed in the crate with the receiver, the crate shall be marked TECHNICAL MANUALS INSIDE.

Figure
2-10



ctions, Simplified Schematic Diagram

Step 4. Observe that the blower operates.

Step 5. Observe that all tube heaters glow.

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NOTE

Due to the low accelerating potential on the crt, a spot may be visible at each end of the horizontal trace. This is a normal presentation.

Step 7. Check proper adjustment of R521 and R534. (See Section 6, paragraph 6-2d.)

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NOTE

This voltage must come through the external teleprinter keyer magnet from an external +110 vdc, 60 ma power supply connected as shown in figure 2-10. If no voltage is measured on pin 5, the wiring of the teletypewriter patch-panel should be carefully checked.

b. OPERATION CHECK. - See table 3-2 and perform all operational steps. Observe that all controls operate freely and that at any setting of the controls, there is no indication of fault.

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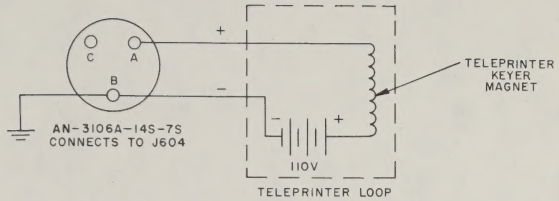


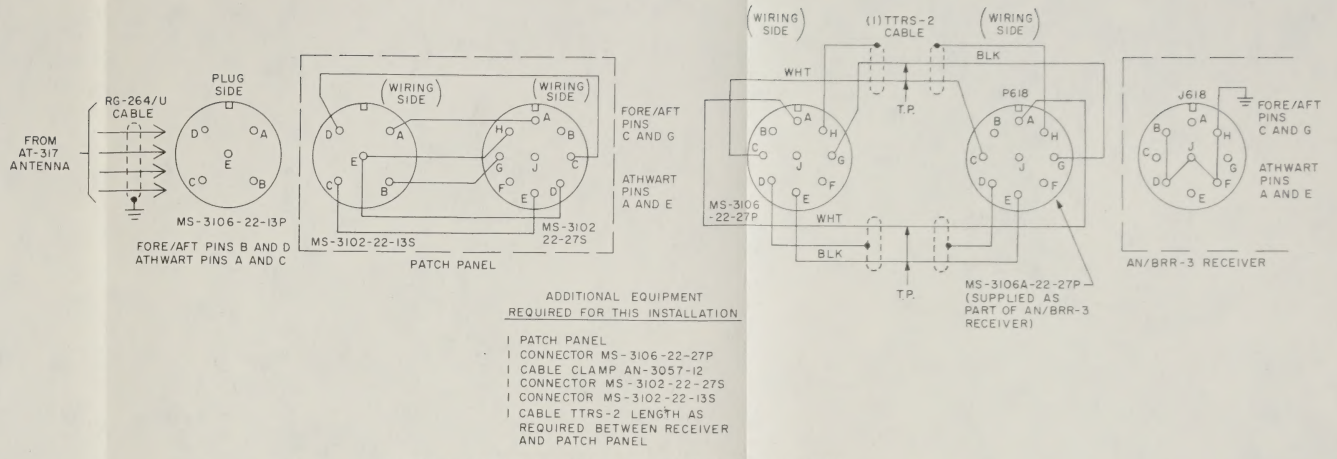


Figure 2-10. External Connections, Simplified Schematic Diagram

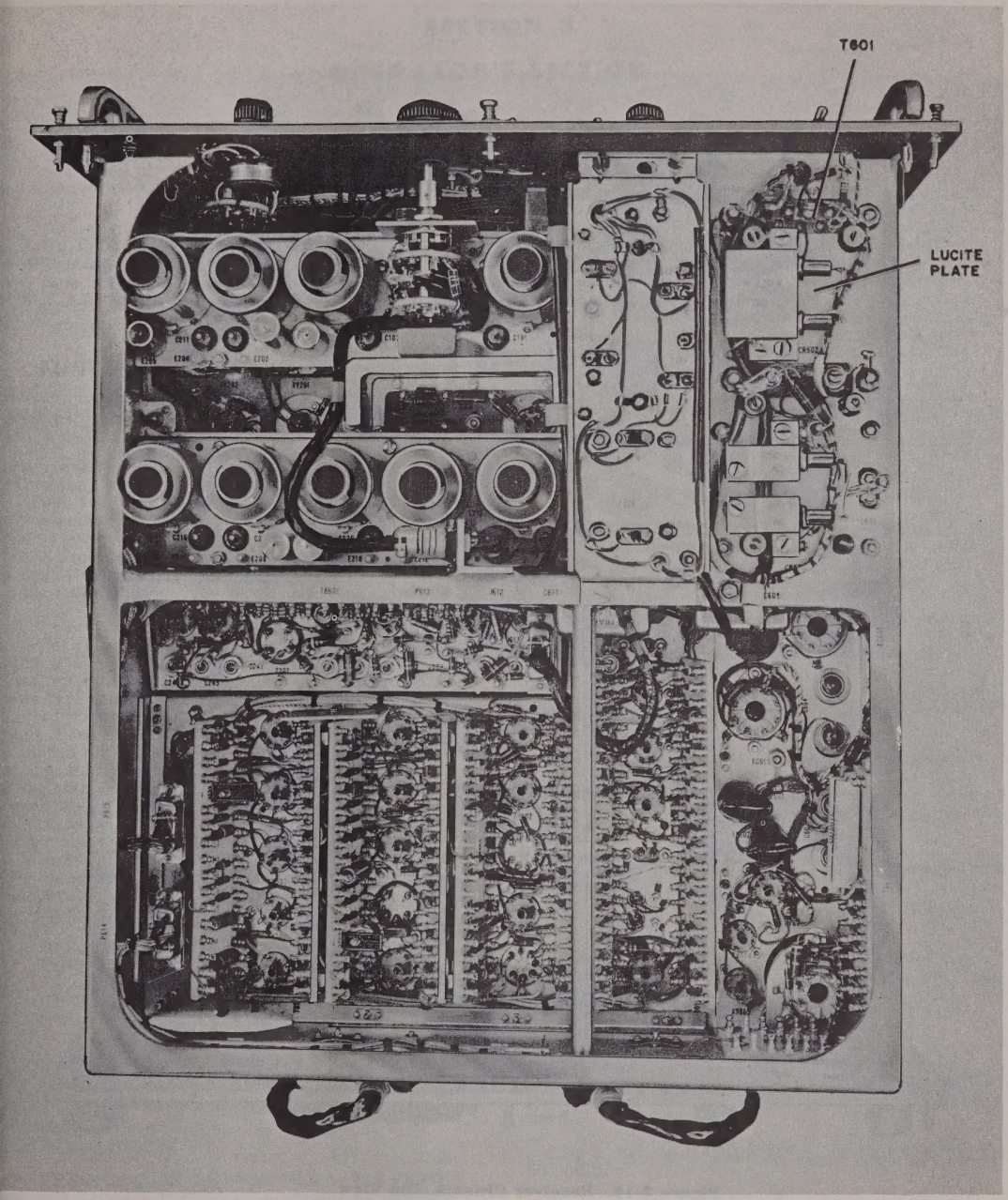


Figure 2-11. Receiver Chassis, Bottom View

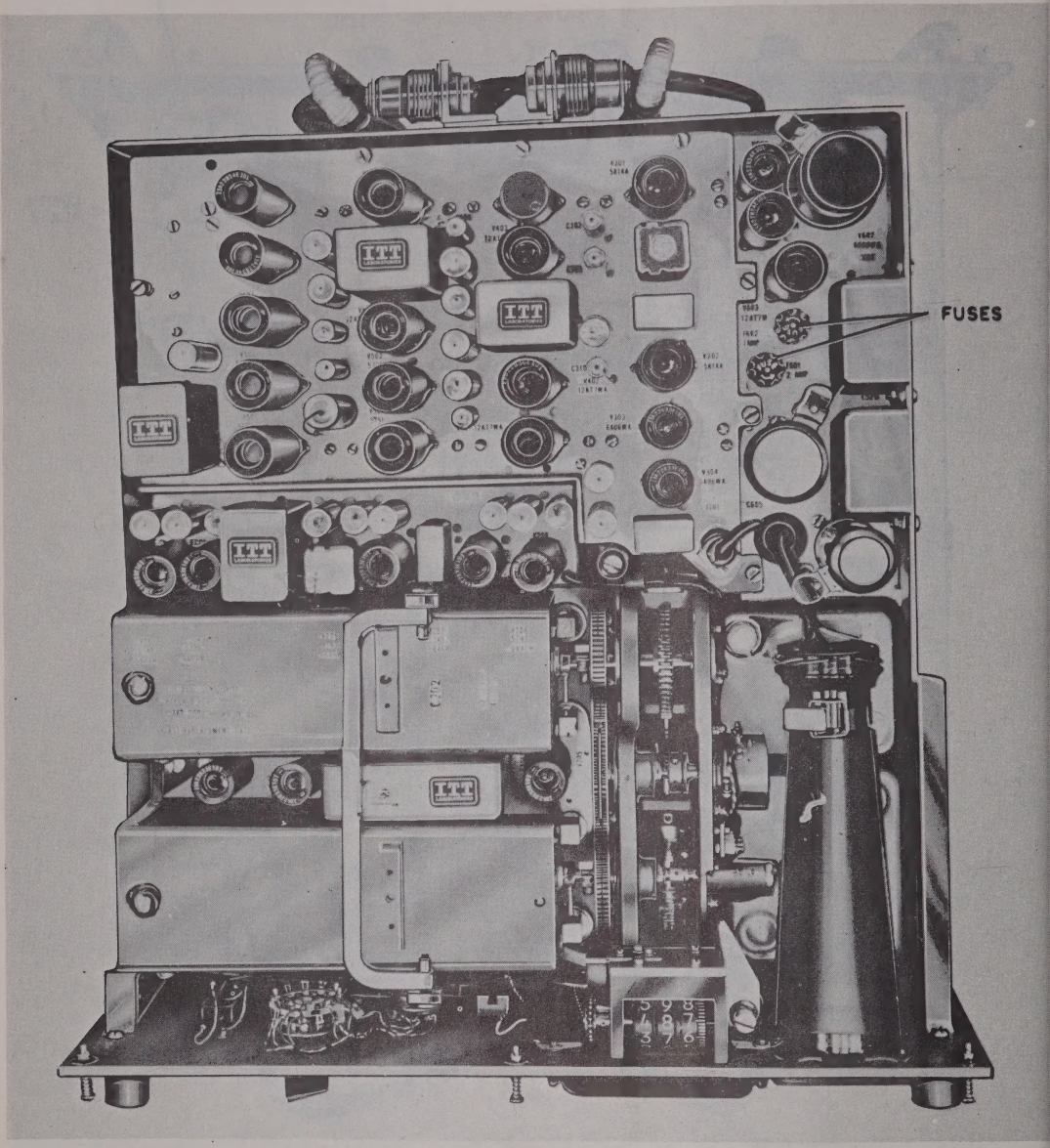


Figure 2-12. Receiver Chassis, Top View

SECTION 3

OPERATOR'S SECTION

3-1. FUNCTIONAL OPERATION.

Radio Receiving Set AN/BRR-3 is designed for general application aboard all types of U.S. Navy vessels. It covers the frequency range from 14 to 30 kc and is normally used to receive either on-off keying (ICW or A_1) or frequency shift keying (FSK or F_1) types of transmission. The receiver has the additional capabilities of receiving facsimile signals (FAX or F_4) when provided with additional terminal equipment, and for use as a homing device when equipped with an antenna of the Loop Antenna AT-317/BRR series.

In use the receiver is connected to accessory government furnished material (GFM) as illustrated in figure 1-1. The three types of antennas shown provide options which adapt the equipment for any type of shipboard use. Selection of one of the antennas provided in any installation is made simple through the use of the ANTENNA SELECTOR switch on the front panel.

The receiver is basically a superheterodyne composed of relatively wide band RF and variable bandwidth IF circuits and impulse noise cancellation circuits, followed by narrow band IF filters. When impulse type interference is received with the desired signal, this receiver produces an audio signal relatively free of interfering noise. The audio signal is amplified and supplied to a front panel jack at selected frequencies of 2500, 1000, or 600 cps for monitoring with headphones or speaker. The 2500 cps signal is also supplied as an input to an FSK discriminator and teleprinter drive circuit to produce an output for use with teleprinter equipment. Automatic gain control (AGC) circuitry is included for use with FSK reception, and a crt indicator is provided to aid the operator in tuning the receiver and monitoring its operation.

3-2. DESCRIPTION OF CONTROLS AND INDICATORS.

a. GENERAL. - The information in this paragraph is provided to familiarize the operator with the various controls and indicators and to instruct him in the recommended operating procedures for the intended uses of the equipment. Table 3-1 lists and describes the operator's controls and indicators and their functions. Figure 3-1 shows the controls and indicators and provides number indexing to their descriptions in table 3-1.

b. FREQ. DIAL INTERPOLATION. - The FREQ. dial (see figure 3-3) provides a reading in numbers of the receiver frequency to within 100 cps. Closer reading of the FREQ. dial to within 10 cps is provided by the graduations at the extreme right end of the dial. The dial setting in figure 3-3 is precisely 15.510 KC. or 15,510 cps. The last two digits in this figure are interpolated as follows: Each of the graduations represents 20 cps, and the long-line graduation represents the beginning of the 20 cps scale. Since the dial pointer is centered between the long-line and the first short-line, the setting represents the dial reading in numbers plus one-half of a 20 cps division or 10 cps. Note that the frequency reading is true only to within the limits of the dial accuracy, ±100 cps.

3-3. SUMMARY OF OPERATING PROCEDURES.

The complete operating procedure is summarized in table 3-2.

3-4. DETAILED OPERATING PROCEDURES.

a. TURN-ON PROCEDURE. - The detailed procedure outlined in this paragraph includes the initial control settings which condition the receiver for use in any of its intended modes of operation.

Step 1. Set the POWER switch to the ON position.

Step 2. Set the NOISE CANCEL switch to the NARROW position.

Step 3. Set the FSK SENSE switch to the HOLD position.

Step 4. Set the AGC-MAN switch to the MAN position.

Step 5. Set the AUDIO tone selector switch to 2500, 1000, or 600 for the desired audio tone.

Step 6. Set the AUDIO-LEVEL control to approximately 5.

NOTE

When the radio room loudspeaker is being used, the AUDIO-LEVEL control should be set to approximately 5, and all further audio level adjustments should be made with the radio room speaker controls.

Step 7. Set the ANTENNA SELECTOR switch to AT-317/BRR OMNI, 50 OHM, or WHIP 2000 MMF position as determined by the type of antenna to be used.

Step 8. Set the BAND WIDTH CPS switch to the 60 position.

Step 9. Set the CRT switch to the SET LEVEL position.

Step 10. Plug a headphone into the AUDIO jack or activate the radio room loudspeaker system.

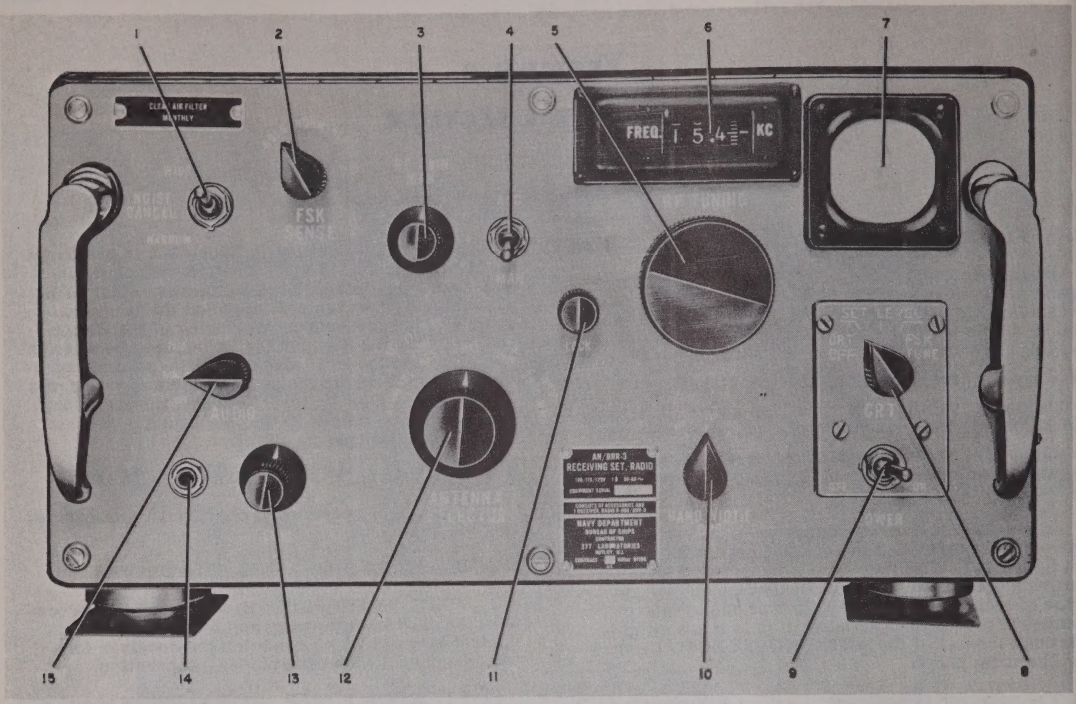


Figure 3-1. Front Panel Controls and Indicators

Step 11. Adjust the RF GAIN MAN control to approximately 8.

Step 12. Turn the dial LOCK counterclockwise to free the RF TUNING knob.

Step 13. Proceed to the tuning procedure detailed in paragraph 3-4b below.

b. TUNING PROCEDURE. - The procedure for tuning the receiver to any desired frequency within its operating range (14 to 30 kc) is detailed in the following paragraphs. The procedure is the same for any of the intended modes of operation.

(1) PRELIMINARY TUNING AND ICW TUNING. - Perform the following steps.

Step 1. Adjust the RF TUNING knob until the desired operating frequency is indicated on the FREQ. dial. The tuning accuracy should be ±100 cps. If a signal is present, it will be audible in either the headphone or loudspeaker, whichever is used. It will also be presented on the crt indicator as a pulsating-rectangular pattern.

Step 2. Immediately readjust the RF GAIN MAN control to obtain a square pattern on the crt. (See figure 3-4.)

Step 3. Carefully adjust the RF TUNING knob for a maximum audio signal. The signal will be heard on either the headphone or radio room loudspeaker.

NOTE

When the radio room loudspeaker is being used, the AUDIO-LEVEL control should be set to approximately 5, and all further audio level adjustments should be made with the radio room speaker controls.

Step 4. Simultaneously with Step 3, readjust the RF GAIN MAN control to maintain an approximate 5/8-inch square pattern on the crt. Maintain this pattern throughout operation.

NOTE

Do not use the crt indication for fine tuning. Use the audio signal for this adjustment while maintaining the square crt pattern with the RF GAIN MAN control.

Step 5. Adjust the AUDIO-LEVEL control to a suitable listening level.

NOTE

When the radio room loudspeaker is being used, the AUDIO-LEVEL control should be set to approximately 5, and all further audio level adjustments should be made with the radio room speaker controls.

TABLE 3-1. RADIO RECEIVING SET AN/BRR-3, CONTROLS AND INDICATORS

FIGURE 3-1 INDEX NO.	CONTROL OR INDICATOR	TYPE	FUNCTION
1	NOISE CANCEL	Two-position toggle switch	Operation of impulse noise cancellation circuit. (1) WIDE position provides maximum cancellation of interfering impulse noise; this is the normal operating position except when tuning receiver and as specified in operating procedures. (2) NARROW position provides minimum cancellation of impulse noise; this is used when tuning receiver and as specified in operating procedures.
2	FSK SENSE	Three-position selector switch	Enables teleprinter operation and adjusts the sense of the receiver teleprinter output for correct operation of that equipment in the event reversed sense FSK transmission is received. (1) HOLD position disables all operation of the teleprinter. (2) NORM position sets the sense of the receiver teleprinter output for standard FSK transmission. Mark condition is the higher of the two transmitted frequencies. (3) REV position sets the sense of the receiver teleprinter output for reversed sense FSK transmission. Mark condition is the lower of the two transmitted frequencies.
3	RF GAIN MAN	Potentiometer	Adjusts amplitude level of received signal so that a square pattern is seen on crt indicator with CRT switch in SET LEVEL position.
4	AGC-MAN	Two-position toggle switch	Selects method of receiver gain control. (1) MAN position enables manual adjustment of received signal amplitude level with RF GAIN MAN control (index no. 3). (2) AGC position selects automatic gain control (AGC) of received signal.
5	RF TUNING	Knob controlled variable capacitor	Tunes receiver frequency.
6	FREQ.	Dial	Displays receiver frequency as set with RF TUNING control (index no. 5). (See paragraph 3-2b for interpolation of dial graduations.)
7	crt indicator	Cathode ray tube	Displays monitored signals.
8	CRT	Three-position selector switch	Selects monitor signals for display on crt indicator (index no. 7).

TABLE 3-1. RADIO RECEIVING SET AN/BRR-3, CONTROLS AND INDICATORS (Continued)

FIGURE 3-1 INDEX NO.	CONTROL OR INDICATOR	TYPE	FUNCTION
8 (cont.)			(1) CRT OFF position deflects beam off face of crt indicator. Used when receiver is not receiving a signal to extend life of crt indicator. (2) SET LEVEL position provides crt indicator display for adjusting the RF GAIN MAN control (index no. 3) to produce a square crt pattern. For FSK signals AGC will automatically maintain proper square pattern. (3) FSK TUNE position provides crt indicator display for fine-tuning receiver with RF TUNING control (index no. 5). FSK pattern vertically centered on crt screen indicates proper tuning.
9	POWER	Two-position toggle switch	Energizes or deenergizes receiver.
10	BAND WIDTH CPS	Three-position selector switch	Selection of 60, 120, or 170 cps 6 db bandwidths for operating as follows: (1) 60 position for ICW reception. (2) 120 position for FSK reception of up to 40 words per minute. (3) 170 position for FSK reception of up to 60 words per minute.
11	LOCK	Dial-lock	Lock setting of FREQ. dial (index no. 6).
12	ANTENNA SELECTOR	Five-position selector switch	Provides selection from three antennas when so equipped (see Section 1, paragraph 1-2). (1) Three AT-317/BRR positions select one of three antenna patterns for optimum reception (see figure 3-2). (2) 50 OHM position selects 50 ohm antenna system (when so equipped). (3) WHIP 2000 MMF position selects either whip or wire antenna (when so equipped).
13	AUDIO-LEVEL	Potentiometer	Adjusts volume of audio output for headphone or loud speaker system.
14	AUDIO (jack)	Telephone jack.	Plugs in 600 ohm headphone.
15	AUDIO (switch)	Three-position selector switch	Selects 2500, 1000, or 600 cps audio output for headphone or loud speaker system.

Step 6. Set the NOISE CANCEL switch to the WIDE position.

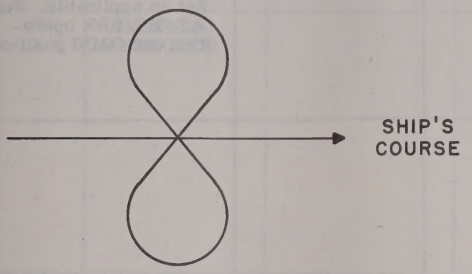
NOTE

The crt vertical deflection will increase if there is an interfering signal being received in the wide band. If this is the case, the NOISE CANCEL switch must be returned to the NARROW position.

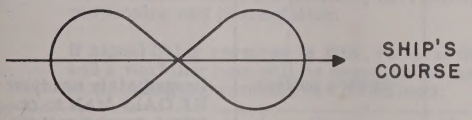
Step 7. Set the ANTENNA SELECTOR switch to the appropriate position as determined by operating conditions. (See figure 3-2.)

NOTE

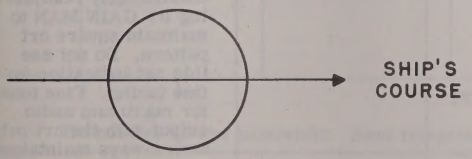
The ANTENNA SELECTOR switch will normally be left in the OMNI position for AT-317/BRR operation as long as reception is adequate. Otherwise, use either the ATHWART or FORE AFT positions. If the switch is left in either the ATHWART or FORE AFT position, continual rechecking of proper position must be performed when the vessel is maneuvering.



RECEPTION PATTERN — ATHWART



RECEPTION PATTERN — FORE AFT



RECEPTION PATTERN — OMNI

Figure 3-2. Reception Patterns using AT-317/BRR Antenna

If the signal being received is ICW, vertical deflection on the scope will change its amplitude in accord with the keying. For this type of transmission, tuning operations are completed. Occasionally check the NOISE CANCEL switch, the ANTENNA SELECTOR switch, and the RF TUNING knob for proper position as described above.

(2) FSK TUNING. - Perform preliminary tuning procedure (see paragraph 3-4b(1)) before proceeding with FSK tuning. If the signal being received is FSK, vertical deflection on the scope will remain constant in amplitude, and a warbling tone will be heard through the headphones or speaker. For this type of transmission, continue tuning adjustments as follows:

Step 1. Set the AGC-MAN switch to the AGC position. Now, the AGC will automatically maintain the scope pattern.

NOTE

If the square pattern in not properly maintained, poor teleprinter operation will result.

Step 2. Set the BAND WIDTH CPS switch to 120 or 170. The 120 position is selected for receiving up to 40 words per minute; the 170 position for up to 60 words per minute. If reception is poor, try alternate positions of the NOISE CANCEL switch and (if applicable) the alternate AT-317/BRR positions.

NOTE

Best teleprinter operation cannot be obtained with a 60 cps bandwidth.

Step 3. Set the CRT switch to the FSK TUNE position. This should result in a double line FSK pattern on the crt (see figure 3-5).

Step 4. Adjust the RF TUNING knob so that the double line pattern is centered in the middle of the crt.

Step 5. Set the FSK SENSE switch to either the NORM or REV position to obtain a uniform rhythmic sound from the teleprinter mechanism.

(3) RECHECK OF FSK TUNING. - If the uniform rhythmic sound from the teleprinter mechanism is disturbed or if printing is incorrect, recheck the adjustments as follows:

Step 1. Set the NOISE CANCEL switch to the NARROW position.

Step 2. Set the CRT switch to the SET LEVEL position.

Step 3. Set the AGC-MAN switch to the MAN position and adjust the RF GAIN MAN control to obtain a square pattern on the crt.

Step 4. Set the ANTENNA SELECTOR switch to the position giving the maximum signal. The OMNI position is preferable when the vessel is maneuvering, since pickup in the ATHWART or FORE AFT positions will vary with the ship's heading.

TABLE 3-2. OPERATING PROCEDURE (SUMMARIZED)

ACTION			OBSERVATION		
STEP	CONTROL	POSITION	INDICATOR	INDICATION	REMARKS
1	POWER	ON			
	NOISE CANCEL	NARROW			
	FSK SENSE	HOLD			
	AGC-MAN	MAN			
	AUDIO (switch)	2500, 1000, or 600			Set for choice of audio tone.
	AUDIO-LEVEL	Approx. 5			
	NOTE When the radio room loudspeaker is being used, the AUDIO-LEVEL control should be set to approximately 5, and all further audio level adjustments should be made with the radio room speaker controls.				
2	ANTENNA SELECTOR	AT-317/BRR (ATHWART, FORE AFT, OMNI), 50 OHM, or WHIP 2000 MMF			Set as applicable. For AT-317/BRR operation use OMNI position.
3	BAND WIDTH CPS	60			
	CRT	SET LEVEL			
	RF GAIN MAN	Approx. 8			
	LOCK	One half turn (approx.) counterclockwise			
	RF TUNING	Adjust to within ±100 cps of desired frequency	FREQ. dial		
	RF GAIN MAN		crt	Square pattern	Immediately readjust RF GAIN MAN to obtain a square pattern (see figure 3-4).
	RF TUNING	Adjust	Headphone or speaker	Audible signal	Carefully fine tune for maximum audio signal, continuously readjusting RF GAIN MAN to maintain square crt pattern. Do not use this crt indication for fine tuning. Fine tune for maximum audio output with the crt pattern always maintained as a square.
	RF GAIN MAN	Adjust	crt	Square pattern, amplitude approx. 5/8-inch.	Maintain this crt pattern as standard throughout operation, i.e., a square.

TABLE 3-2. OPERATING PROCEDURE (SUMMARIZED) (Continued)

ACTION			OBSERVATION		
STEP	CONTROL	POSITION	INDICATOR	INDICATION	REMARKS
4	AUDIO-LEVEL	Adjust	Headphone or speaker	Audible signal	Adjust as desired.
		NOTE When the radio room loudspeaker is being used, the AUDIO-LEVEL control should be set to approximately 5, and all further audio level adjustments should be made with the radio room speaker controls.			
5	NOISE CANCEL	WIDE	crt	Vertical	Make sure crt vertical deflection does not increase when NOISE CANCEL switch is set to WIDE. This will be due to an interfering signal received in the wide band. If crt deflection increases, NOISE CANCEL switch must be returned to NARROW.
6	ANTENNA SELECTOR		crt	Relative vertical deflection	Normally left in OMNI position for AT-317/BRR operation as long as reception is adequate. Otherwise, try ATHWART or FORE AFT positions. If left in either FORE AFT or ATHWART, continual rechecking of proper position must be performed when vessel is maneuvering.
		NOTE If signal being received is ICW, vertical deflection on crt will change in amplitude in accordance with keying for this type of transmission. Tuning for ICW is completed. Occasionally check NOISE CANCEL position, ANTENNA SELECTOR position, and RF TUNING for proper positioning and presentation. If signal being received is FSK, vertical deflection on crt will remain constant in amplitude and a warbling tune will be heard on the headphones or speaker. For this type of transmission, tuning adjustments are as follows:			
7	AGC-MAN	AGC	crt	Square pattern	AGC will automatically maintain the scope pattern.
8	BAND WIDTH CPS	120 or 170			120 is selected for receiving up to 40 words per minute; 170 for up to 60 words per minute.
		NOTE Do not use 60 cps bandwidth: Best teleprinter operation will not be obtained.			
9	CRT	FSK TUNE	crt	Double line FSK pattern (see figure 3-5)	
	RF TUNING	Adjust	crt	Adjust so that the double line pattern is in the middle of the crt	

TABLE 3-2. OPERATING PROCEDURE (SUMMARIZED) (Continued)

ACTION			OBSERVATION		
STEP	CONTROL	POSITION	INDICATOR	INDICATION	REMARKS
10	FSK SENSE	NORM or REV	Teleprinter	Adjust to obtain uniform rhythmic sound from the teleprinter mechanism	
	NOTE If uniform rhythmic sound from teleprinter is disturbed or if printing is incorrect, recheck adjustments as follows:				
11	NOISE CANCEL	NARROW			
	CRT	SET LEVEL			
	AGC-MAN	MAN			
	RF GAIN MAN	Adjust	crt	Square pattern	Adjust the RF GAIN MAN for a square pattern.
	ANTENNA SELECTOR (if using AT-317/BRR)		crt	Relative amplitude	Leave on loop position giving maximum signal. Realize that if the vessel is maneuvering, OMNI is preferable since pickup in the FORE AFT or ATHWART positions will vary with the ship's heading.
	NOISE CANCEL	WIDE then NARROW then WIDE	crt	Square pattern	Any marked change in the vertical amplitude of the square pattern when the NOISE CANCEL switch is set from WIDE to NARROW indicates an interfering signal present in wide band. If this is true, set the NOISE CANCEL switch to NARROW; if not, use WIDE.
	AGC-MAN	AGC	crt	Square pattern	AGC should automatically maintain a square pattern.
	CRT	FSK TUNE	crt	Double line FSK pattern	
	RF TUNING	Adjust	crt	Center the double line pattern	

Figure 3-3. RF TUNING, FREQ. Dial Set at 15.5 KC

Step 5. Alternately switch the NOISE CANCEL switch from the WIDE position to the NARROW position and back again. If there is any change in the vertical amplitude of the crt square pattern when the NOISE CANCEL switch is set from WIDE to NARROW, there is an interfering signal present in wide band. If this is true, leave the NOISE CANCEL switch in the NARROW position; if not, use the WIDE position.

Step 6. Set the AGC-MAN switch to the AGC position. The AGC will automatically maintain a square crt pattern.

Step 7. Set the CRT switch to the FSK TUNE position to obtain a double line FSK pattern on the crt.

Step 8. Adjust the RF TUNING knob in order to center the crt double line pattern.

c. HOMING PROCEDURE. - The receiver may be used as a homing device when equipped to operate with an AT-317/BRR series antenna. Use the procedure outlined below:

Step 1. Select a station for homing and tune the receiver to that frequency (see paragraph 3-4b).

Step 2. Determine the approximate direction of the station (within ±90 degrees) and have the ship's heading changed accordingly.

Step 3. Set the ANTENNA SELECTOR switch to the AT-317/BRR ATHWART position.

Step 4. Monitor the homing station signal through the headphone, and continue having the ship's heading changed in the direction established in Step 2 until a null is noticed in the monitored signal. At this time the ship's heading is either directly to or directly away from the homing station.

Step 5. Have the ship's heading maintained to continuously affect a null in the monitored signal.

Step 6. Check periodically by having the ship's course slightly changed to the right and left of the heading which affects a null in the monitored signal.

NOTE

Using the homing procedure outlined above, it is possible to be heading in a direction opposite that of the homing station when the null condition is noticed. Therefore, it is mandatory to know the approximate location of the homing station (as in Step 2 of this procedure).

d. SECURING. - No special procedure is required in securing the equipment from use. This is accomplished simply by setting the POWER switch to the OFF position.

3-5. EMERGENCY OPERATION.

No emergency operating procedures are specified for this equipment. Generally, the normal operating procedures discussed in paragraph 3-4 above will apply for all conditions. However, the following rule may be noted for operating with either weak signals or signals subjected to strong interference. Try operating with the alternate positions of the NOISE CANCEL switch; and/or if operating with an AT-317/BRR antenna, try the alternate AT-317/BRR positions of the ANTENNA SELECTOR switch.

3-6. OPERATOR'S MAINTENANCE.

Normally, the operator will only be responsible for determining that the receiver is operating properly. This will be accomplished through the performance of operating checks and routine checks. All maintenance, except when operating under emergency conditions, will be performed by maintenance personnel. Operating checks, routine checks, and operator's emergency maintenance are discussed in the following paragraphs.

a. OPERATING CHECKS. - Table 3-3 provides procedures for checking the operation of the receiver. These procedures will be used by the operator when the receiver is turned on and/or occasionally during operation. The table lists the items checked and provides the control operations and normal indications for the checks. When a malfunction (anything other than the normal indications listed in the table) is indicated as a result of the checks, the operator should notify maintenance personnel immediately. If a malfunction is indicated while operating under emergency conditions and maintenance personnel are not available, the operator should follow the instructions provided in paragraph 3-6c below. The checks in table 3-3 should be performed in the order listed. This is necessary, since a check may be dependent upon the control settings and/or the results of a previous check.

TABLE 3-3. RADIO RECEIVING SET AN/BRR-3, OPERATING CHECKS

ITEM	ACTION		OBSERVATION	
	CONTROL	POSITION	INDICATOR	NORMAL INDICATION
Power	POWER	ON	Blower and dial lamps	Motor operating as evidenced by sound and at least one FREQ. dial lamp lit.
Pilot lights			FREQ. dial lamps	A lighted lamp visible on both sides of dial.
RF gain, wide band IF gain, and crt indicator	ANTENNA SELECTOR	To that position from which it is most convenient to completely disconnect the external antenna from receiver; e.g., WHIP position and then disconnect WHIP cable at ship's distribution panel		
	AGC-MAN	MAN		
	NOISE CANCEL	WIDE		
	RF GAIN MAN	Full counterclockwise		
	CRT	SET LEVEL	crt	A horizontal line on the screen.
	RF GAIN MAN	Advanced clockwise	crt	A square pattern produced from thermal noise. Thermal noise is differentiated from received atmospheric noise by its constant waving nature as opposed to the sharp spiked quality of received atmospheric noise. RF GAIN MAN scale position should be between 7 and 9.
	NOISE CANCEL	NARROW	crt	Thermal noise deflection on crt should drop to approximately half its above amplitude and appear more rounded.
Noise cancel gain, narrow band IF gain, and audio gain	RF TUNING	Correctly tune in a station		
	RF GAIN MAN	Adjust to produce standard square pattern	crt	
	AUDIO-LEVEL	Adjust	Headphone	Signal audible and at comfortable level.
	AUDIO (switch)	Set to 600, 1000, and 2500	Headphone	Tone of signal changes, but there is no appreciable change in signal level in any of the switch positions.
Noise cancel-lation	RF TUNING	Correctly tune in a station		

TABLE 3-3. RADIO RECEIVING SET AN/BRR-3, OPERATING CHECKS (Continued)

ITEM	ACTION		OBSERVATION	
	CONTROL	POSITION	INDICATOR	NORMAL INDICATION
	RF GAIN MAN	Adjust slowly clockwise	Headphone	As RF GAIN MAN control is continuously advanced from its correctly adjusted position for a square pattern, the level of the audio signal should first slightly increase, then decrease appreciably, and again increase.
	NOISE CANCEL	WIDE		
	CRT	SET LEVEL		
	RF GAIN MAN	Readjust for square pattern	crt	
	NOISE CANCEL	NARROW	crt	When switch is set from WIDE to NARROW, crt deflection should change negligibly.
Discriminator centering	Correctly tune in a station transmitting CW			
	CRT	FSK TUNE		
	BAND WIDTH CPS	60		
	RF TUNING	Slowly adjust alternately clockwise and counterclockwise	crt	Pattern moves back and forth through vertical center of the scope.
			Headphone	Maximum audio level heard when pattern passes through vertical center of crt indicator.
AGC	Correctly tune in a station transmitting CW or FSK			
	CRT	SET LEVEL		
	AGC-MAN	AGC	crt	Amplitude of pattern automatically maintained at standard square pattern.

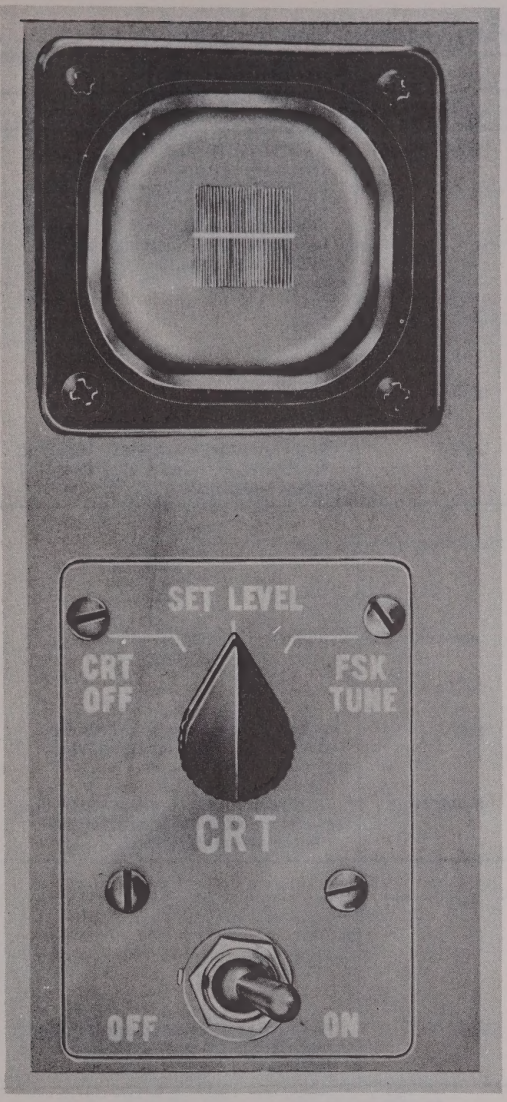


Figure 3-4. Cathode Ray Tube Indicator, Standard Square Pattern Presentation

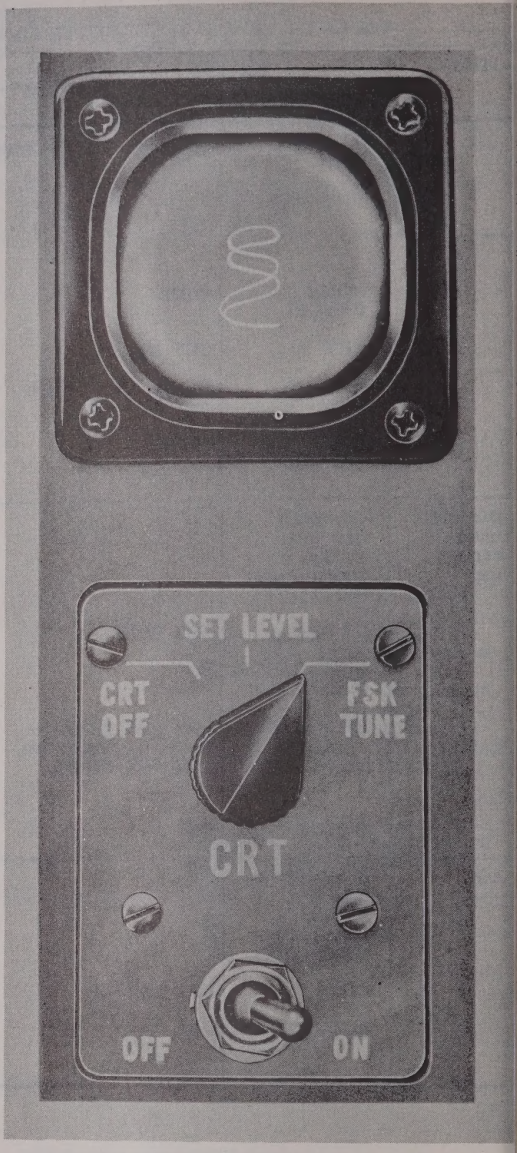


Figure 3-5. Cathode Ray Tube Indicator, FSK Presentation

b. ROUTINE CHECKS. - Routine check procedures and check charts are provided in the Maintenance Standards Book, NAVSHIPS 93716.42.

c. EMERGENCY MAINTENANCE. - If a malfunction occurs during emergency operating conditions and maintenance personnel are not available, proceed as follows:

NOTE

Maintenance personnel should be called as soon as possible and notified of the malfunction.

Step 1. Set the POWER switch to OFF.

Step 2. Loosen the six quarter turn fasteners on the front panel and pull receiver chassis from cabinet.

Step 3. Check for apparent physical damage.

Step 4. Check for and replace open (defective) fuses. (See paragraph 3-6c(2) for fuse location, removal, and replacement.)

Step 5. Set POWER switch to ON.

CAUTION

Never replace a defective fuse with one of a higher current rating unless continued operation is more important than the possible resulting damage to the equipment.

Step 6. Check for and replace obviously defective tubes; for example, open filaments as evidenced by an unlighted filament, and/or gaseous tubes as evidenced by a blue glow. See figure 6-16 for tube location and identification. See paragraph 3-6c(4) for replacement of electron tubes.

Step 7. Proceed as instructed in paragraph 3-6c(1) below.

(1) OPERATOR'S EMERGENCY TROUBLE-SHOOTING. - Table 3-4 provides corrective actions for malfunctions indicated through the performance of the operating checks outlined in table 3-3 above. Complete the checks in table 3-3 and, if an incorrect indication is observed for one of the checks, perform the corrective action shown for that check in table 3-4.

(2) REPLACING FUSES. - The two 2-ampere slow-blow fuses are located on the top of the receiver chassis on the right side (see figure 6-7). The receiver chassis must be withdrawn from the cabinet for access to them. Remove and replace fuses as follows:

Step 1. Set POWER switch to OFF.

Step 2. Turn fuse cap counterclockwise, and remove cap and attached fuse from receptacle.

Step 3. If fuse is defective, pull fuse from cap and insert new fuse of same type and equal rating.

Step 4. Replace fuse and fuse cap into receptacle and turn cap clockwise to secure.

Step 5. Set POWER switch to ON.

(3) REPLACING DIAL LAMPS. - Two dial lamps are located on the front panel (see figure 6-7), one on each side of the FREQ. dial. The receiver chassis must be withdrawn from the cabinet to gain access to the lamps. Remove and replace the lamps as follows:

Step 1. Set POWER switch to OFF.

Step 2. Turn lamp holding assembly counterclockwise to free the lamp (do not remove lamp holding assembly).

Step 3. Insert new lamp (type AN-327) into lamp holding assembly and turn assembly clockwise to secure.

Step 4. Set POWER switch to ON and observe that the new lamp lights.

(4) REPLACING ELECTRON TUBES. - Figure 6-16 locates and identifies all the electron tubes used in the receiver. The tubes are all accessible from the top side of the receiver chassis when the chassis is withdrawn from the cabinet. Always remove power from the equipment (set POWER switch to OFF) before removing and replacing a tube. Always replace a tube with the same tube type or approved equivalent.

TABLE 3-4. RADIO RECEIVING SET AN/BRR-3, OPERATOR'S EMERGENCY TROUBLE-SHOOTING

OPERATING CHECK	ABNORMAL INDICATION	EMERGENCY MAINTENANCE
Power	Blower motor not operating but at least one FREQ. dial lamp is lit.	Shut down and notify maintenance personnel.
	Blower motor not operating and neither of the two FREQ. dial lamps are lit.	Replace fuses (see paragraph 3-6c(2) for instructions).
Pilot lights	Blower motor operating and either one or both FREQ. dial lamps are out.	Continue operating and if necessary replace dial lamps (see paragraph 3-6c(3) for instructions).
crt indicator	No horizontal line on crt but noise is audible in headphone when RF GAIN MAN control is advanced.	(1) Verify that CRT switch is in SET LEVEL position. (2) Replace following tubes one at a time: V603, V601 (crt).
	Horizontal line but no noise pattern when RF GAIN MAN control is advanced; noise is audible in headphone and level is adjustable with RF GAIN MAN control.	Replace in order: V603, V401.

TABLE 3-4. RADIO RECEIVING SET AN/BRR-3, OPERATOR'S EMERGENCY TROUBLE-SHOOTING (Continued)

OPERATING CHECK	ABNORMAL INDICATION	EMERGENCY MAINTENANCE
crt indicator (continued)	No horizontal line on crt indicator and no noise audible in headphone when RF GAIN MAN control is fully advanced. Unable to produce a square (approx. 5/8-inch amplitude) pattern with RF GAIN MAN control fully advanced.	Replace the following tubes one at a time in order shown: V602, V603, V604, V605. Try alternate position of NOISE CANCEL switch; then replace the following tubes, one at a time: V201, V202, V203, V204, V205, V206, V207, V208, V301.
Audio	Normal crt indication but no signal audible in headphone with AUDIO-LEVEL control fully advanced. No signal audible in headphone in the 1000 and 600 positions of the AUDIO switch, but signal is present in 2500 position.	(1) Try alternate positions of AUDIO and BAND WIDTH CPS switches. (2) Replace following tubes one at a time: V301, V303, V304, V403. (1) Continue operating with available signal. (2) Replace V402.
Noise cancellation	Level of signal does not vary as described.	(1) Continue operating. (2) Change V301, V302.
Discriminator centering	Double line pattern present on crt indicator, but pattern and signal level do not behave as described.	Continue operating as long as teleprinter operates normally.
AGC	Amplitude of crt indicator pattern is not maintained as described when AGC-MAN switch is set to AGC.	(1) Operate with RF GAIN MAN control (AGC-MAN switch set to MAN). (2) Replace V401.

SECTION 4

PRINCIPLES OF OPERATION

4-1. OVERALL FUNCTIONAL DESCRIPTION.

Radio Receiving Set AN/BRR-3 (the receiver) is discussed with reference to the block diagrams (see figures 4-1 and 4-2). This section describes signal flow through the receiver from the antenna coupling circuits to the final audio and teletype outputs. A detailed description of each circuit is included in subsequent paragraphs.

Selectivity and gain of the receiver is influenced by the requirements of the impulse noise cancellation circuit. Operation of this circuit depends upon amplification in a wide prenoise cancel bandwidth; limiting, gated subtraction, and signal feedback in the circuit itself; and finally narrow band selectivity. The impulse noise cancellation circuit provides improvement in signal reception when impulse noise, characteristic of VLF atmospherics, is being received.

Receiver gain is built up from the antenna in a wide (1.1 kc at 6 db) bandwidth to a level sufficient to operate the impulse noise cancellation circuit. This level is 1.2 volts peak-to-peak. The wide prenoise cancel bandwidth is necessary to maintain the short time duration of an impulse disturbance prior to the impulse noise cancellation circuit.

The intelligence bandwidth and, therefore, the effective thermal noise bandwidth of the receiver are not the wide prenoise cancel bandwidth, but instead they are the narrow postnoise cancel bandwidth of either 60, 120, or 170 cps as chosen by the operator.

a. ANTENNA COUPLING CIRCUITS. - The receiver uses a double loop antenna (AT-317/BRR), a 50 ohm resistive antenna, or a whip antenna depending upon the position of ANTENNA SELECTOR switch S101.

b. TUNABLE RF CIRCUITS. - Three double tuned RF amplifiers are employed to meet the demands of gain control, skirt ratios for spurious response protecting, and to maintain a 6 db bandwidth of 1000 cps at each frequency from 14 to 30 kc.

c. MIXER AND VARIABLE BANDWIDTH PRENOISE CANCEL IF CIRCUITS. - The local oscillator operates above the incoming signal and when combined in the mixer with the incoming signal produces a 2500 cps IF output. The output of the mixer is coupled to the first IF amplifier by a wide band filter, Z202, or a 170 cycle bandwidth narrow band filter, Z201. The filter is selected by relay K201 which is activated by NOISE CANCEL switch S601 located on the front panel. The narrow band filter is used when a strong interfering signal is present in the wide band, thus making wide prenoise cancel bandwidth operation impractical. The prenoise cancel RF-IF selectivity is illustrated in figure 4-3.

d. NOISE CANCELLATION AND NARROW BAND POSTNOISE CANCEL IF CIRCUIT. - The first IF section feeds the noise cancellation circuit. This circuit offers protection against a disturbance of an impulse type. The output of the noise cancellation circuit feeds a narrow band IF amplifier. The filters in this amplifier set the intelligence bandwidth and, therefore, the thermal noise sensitivity of the receiver. Either 170, 120, or 60 cps wide filters may be selected by BAND WIDTH CPS switch S301 located on the front panel. The postnoise cancel selectivity is illustrated in figure 4-4.

e. AUDIO CIRCUITS. - The converter is associated with either a 3500 or 3100 cps fixed frequency BFO to produce an output of 1000 or 600 cps when mixed with the 2500 cps IF. AUDIO tone control switch S602 located on the front panel will select any one of three audio outputs; namely, 2500, 1000, or 600 cps. The audio output circuit uses feedback to maintain a relatively constant output level for load variations of 600 to 200 ohms. The audio circuit is adjusted to deliver a maximum of 15 mw into 600 ohms.

f. FSK DETECTING CIRCUITS. - The narrow band postnoise cancel IF amplifier also feeds the FSK detecting circuits when the FSK SENSE switch is in the NORM or REV position. The limiter circuit removes amplitude variations from the ac signal. The output of the limiter feeds the discriminator. The discriminator produces a dc voltage output which is directly proportional to the number of cps that the input frequency differs from 2500 cps. The discriminator feeds a low pass filter which preserves the keying wave due to its linear phase response characteristics. The output of the low pass filter feeds the teletype keyer circuits.

g. TELETYPE KEYER CIRCUITS. - The rounded sides of the detected FSK signal are squared by a special amplifier-limiter chain; the resulting signal then drives output tubes V508 and V509. These output tubes control a 60 ma current which in turn drives an external teleprinter.

h. GAIN CONTROL CIRCUITS. - Following the prenoise cancel IF amplifier in a side chain, the signal is further amplified, detected, and used for automatic gain control. AGC-MAN switch S604 located on the front panel selects either manual or automatic gain control. Two gain control voltages are provided; namely, a normal control for the mixer and the three IF amplifiers, and a delayed gain control for the first RF amplifier tube. The frequency dial setting of the RF TUNING control produces an additional gain control voltage which controls the gain of the second and third TRF amplifiers; this additional gain control voltage keeps receiver gain from varying when RF TUNING is varied.

i. CRT CIRCUITS. - For proper operation of the noise cancellation circuit, it is imperative that a standard desired signal level of 1.2 volts peak-to-peak be supplied to the circuit's input. When CRT switch S603 is set to SET LEVEL position, the crt gives a visual display of the signal supplied to the noise cancellation circuit. Proper operation is obtained when the observed vertical deflection is set to approximately 5/8 inch.

When CRT switch S603 is set to FSK TUNE position, vertical deflection of the crt is proportional to the discriminator output. When FSK is being received, the receiver is correctly tuned if this pattern is centered on the crt indicator. When CRT switch S603 is set to the CRT OFF position, the beam is deflected off the face of the crt. This prolongs the life of the crt (V601).

j. POWER SUPPLY. - All voltages necessary for operation of the receiver are derived from an ac operated power supply. Taps on the primary of the power transformer accommodate the receiver to input voltages from 105 to 125 vac at a frequency of 50 to 60 cycles. POWER switch S607 located on the front panel breaks both sides of the input ac line. Fuses F601 and F602 mounted on the chassis frame protect both sides of the line. Blower B601 is also connected via POWER switch S607 to the input line.

4-2. FUNCTIONAL SECTIONS. (See figure 4-2.)

a. ANTENNA COUPLING CIRCUITS. - The antenna coupling circuit is designed to provide optimum reception in each antenna position and to maintain at least a 1000 cps bandpass for proper operation of the impulse noise cancellation circuit. The antenna coupling circuits are controlled by ANTENNA SELECTOR switch S101 to accommodate each of the following antenna positions.

(1) ATHWART. (See figure 4-5.) - The athwart loop of the AT-317/BRR is connected to terminals A and B of transformer T102 when ANTENNA SELECTOR switch S101 is in the ATHWART position. The equivalent winding on transformer T101 is shorted by switch S101. The bandwidth of the resonant circuit is set to approximately 1000 cps at each frequency across the 14 to 30 kc band by a Q compensating network, consisting of resistor R102 and capacitor C107. In all ANTENNA SELECTOR positions the first RF tube is fed from terminal H of T102.

(2) FORE AFT. - The fore aft circuitry is identical to the athwart, except that the fore aft loop is connected to terminals A and B of T102.

(3) OMNI. (See figure 4-6.) - The athwart loop of the AT-317/BRR is connected to terminals A and B of T102 as in the athwart function. The fore aft loop is fed to terminals A and B of T101. Q compensation networks, consisting of resistor R101 and capacitor C106 for one resonant circuit, and resistor R102 and capacitor C107 for the other resonant circuit, set the bandwidth of each resonant circuit at 1000 cps. In order to obtain omni directivity with the two loops at a mechanical 90 degrees to each other, the two resulting signals are added, keeping the amplitudes unchanged and shifting the phase of one voltage by 90 degrees with reference to the other voltage. This is accomplished across the band by coupling capacitors C105 and C108.

(4) 50 OHM. (See figure 4-7.) - With a resistive 50 ohm antenna system T102 is again utilized, and T101 is shorted. Dummy coil L101 is used with T102 to replace the AT-317/BRR loop and thus supply the inductance required in the resonant circuit. Capacitor C109 represents the loop cable capacitance of the AT-317/BRR antenna. The 50 ohm resistive antenna system is fed to terminals R and F of T102. In order to obtain optimum performance with the 50 ohm antenna, the compensating network consisting of resistor R102 and capacitor C107 is shorted out. The bandwidth is still greater than 1000 cps across the band due to the loading of the transformed 50 ohms. The 50 ohm impedance is transformed to the grid of the first RF amplifier (V201) by T102. With this transformed impedance, the unloaded impedance of T102 in conjunction with the noise equivalent resistance of V201 results in a receiver noise figure of approximately 1 db.

(5) WHIP OR WIRE. (See figure 4-8.) - When the whip antenna is used, dummy coil L101 and dummy capacitor C109 are connected as in the 50 ohm connection. The whip antenna is placed in series with the resonant circuit. The capacitance of the antenna and cable replaces capacitor C108. As the antenna capacitance is placed in series with the other capacitance of the resonant circuit, its value is not critical if greater than 1000 uuf. The Q compensating circuit consisting of resistor R102 and capacitor C107 is left in the circuit to maintain the RF bandwidth necessary for good impulse noise cancellation.

b. RF CIRCUITS. (See figure 4-2.) - Three double-tuned RF stages are employed to meet the demands of gain control range, selectivity, etc. The purpose of the RF circuits is to accept an input in the 14 to 30 kc region from any of the three antenna systems and to deliver an output to the mixer.

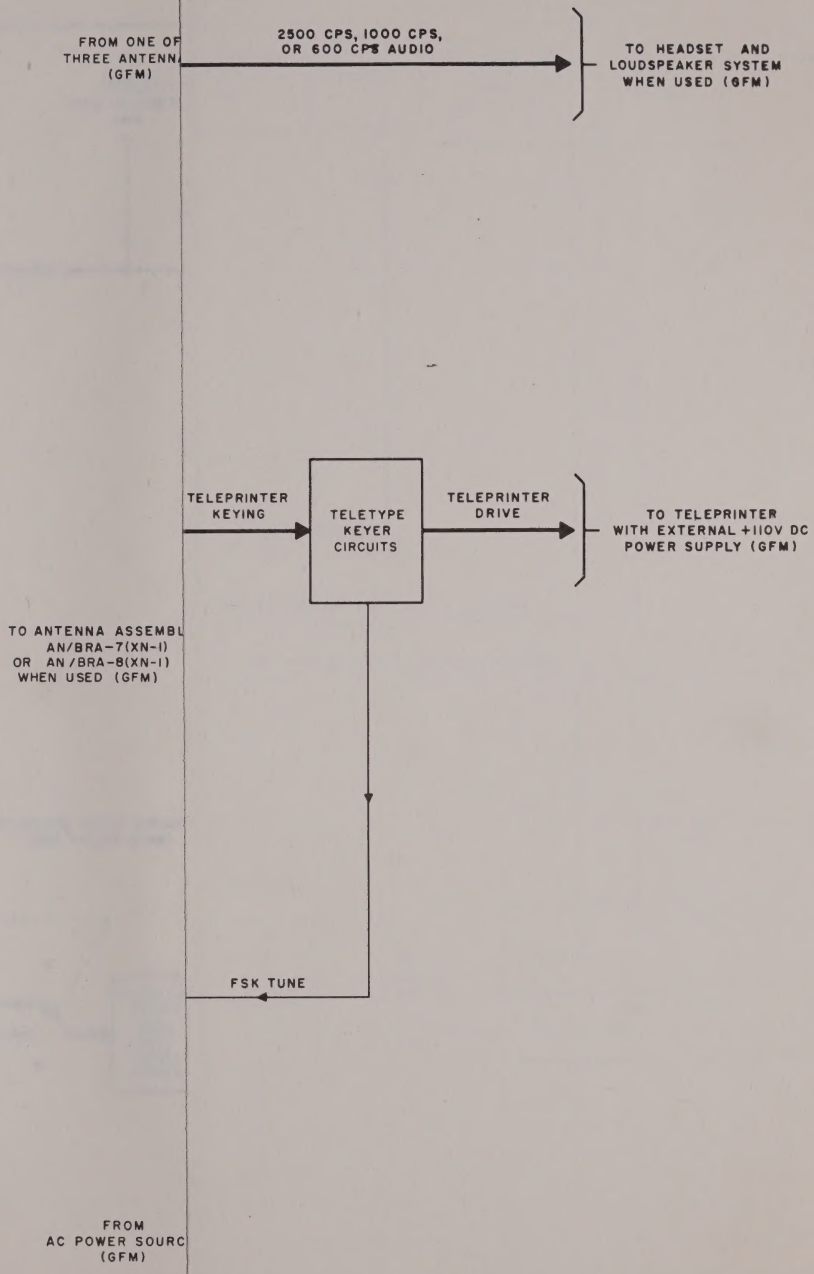
(1) TRF AMPLIFIER. (See figure 4-9.) - For good impulse noise cancellation the bandwidth of each resonant circuit is set to approximately 1000 cps at each frequency across the 14 to 30 kc band by a Q compensating parallel RC circuit placed in series with each coil.

Two types of coupling are employed in each stage in order to maintain correct coupling at each frequency in the 14 to 30 kc band. Capacitors C208 and C209 provide the two types of coupling.

This type of circuit has a large stage gain variation versus tuning. This gain variation is compensated for by varying the grid bias on TRF amplifier tubes V202 and V203. This is accomplished by frequency gain control (FGC) variable resistor R227, which is coupled to the RF TUNING control.

Referring to the first TRF stage in figure 4-9, each stage uses a double tuned circuit. The HL winding of transformer T201 and main tuning capacitor C201C comprise one resonant circuit of the double tuned stage. The associated Q compensating circuit consists of resistor R204 and capacitor C207. Temperature compensating capacitor C205 and trimming capacitor C206 complete the basic resonant circuit. Coupling capacitors C208 and C209 couple one resonant circuit to the second (identical to the first). The two transformer turns ratios are set to produce a stage gain of approximately 5 at 14 kc. The low pass filter, consisting of resistor R206 and capacitor C256 appearing at the grid of V202, and a similar

Figure 4-1


FROM ONE OF THREE ANTENNA (GFM)
2500 CPS, 1000 CPS, OR 600 CPS AUDIO
TO HEADSET AND LOUDSPEAKER SYSTEM WHEN USED (GFM)
TELEPRINTER KEYING
TELETYPE KEYER CIRCUITS
TELEPRINTER DRIVE
TO TELEPRINTER WITH EXTERNAL +110V DC POWER SUPPLY (GFM)
TO ANTENNA ASSEMBL AN/BRA-7(XN-1) OR AN/BRA-8(XN-1) WHEN USED (GFM)
FSK TUNE
FROM AC POWER SOURC (GFM)

eiving Set AN/BRR-3, Block Diagram

i. CRT CIRCUITS. - For proper operation of the noise cancellation circuit, it is imperative that a standard desired signal level of 1.2 volts peak-to-peak be supplied to the circuit's input. When CRT switch S603 is set to SET LEVEL position, the crt gives a visual display of the signal supplied to the noise cancellation circuit. Proper operation is obtained when the observed vertical deflection is set to approximately 5/8 inch.

When CRT switch S603 is set to FSK TUNE position, vertical deflection of the crt is proportional to the discriminator output. When FSK is being received, the receiver is correctly tuned if this pattern is centered on the crt indicator. When CRT switch S603 is set to the CRT OFF position, the beam is deflected off the face of the crt. This prolongs the life of the crt (V601).

j. POWER SUPPLY. - All voltages necessary for operation of the receiver are derived from an ac operated power supply. Taps on the primary of the power transformer accommodate the receiver to input voltages from 105 to 125 vac at a frequency of 50 to 60 cycles. POWER switch S607 located on the front panel breaks both sides of the input ac line. Fuses F601 and F602 mounted on the chassis frame protect both sides of the line. Blower B601 is also connected via POWER switch S607 to the input line.

4-2. FUNCTIONAL SECTIONS. (See figure 4-2.)

a. ANTENNA COUPLING CIRCUITS. - The antenna coupling circuit is designed to provide optimum reception in each antenna position and to maintain at least a 1000 cps bandpass for proper operation of the impulse noise cancellation circuit. The antenna coupling circuits are controlled by ANTENNA SELECTOR switch S101 to accommodate each of the following antenna positions.

(1) ATHWART. (See figure 4-5.) - The athwart loop of the AT-317/BRR is connected to terminals A and B of transformer T102 when ANTENNA SELECTOR switch S101 is in the ATHWART position. The equivalent winding on transformer T101 is shorted by switch S101. The bandwidth of the resonant circuit is set to approximately 1000 cps at each frequency across the 14 to 30 kc band by a Q compensating network, consisting of resistor R102 and capacitor C107. In all ANTENNA SELECTOR positions the first RF tube is fed from terminal H of T102.

(2) FORE AFT. - The fore aft circuitry is identical to the athwart, except that the fore aft loop is connected to terminals A and B of T102.

(3) OMNI. (See figure 4-6.) - The athwart loop of the AT-317/BRR is connected to terminals A and B of T102 as in the athwart function. The fore aft loop is fed to terminals A and B of T101. Q compensation networks, consisting of resistor R101 and capacitor C106 for one resonant circuit, and resistor R102 and capacitor C107 for the other resonant circuit, set the bandwidth of each resonant circuit at 1000 cps. In order to obtain omni directivity with the two loops at a mechanical 90 degrees to each other, the two resulting signals are added, keeping the amplitudes unchanged and shifting the phase of one voltage by 90 degrees with reference to the other voltage. This is accomplished across the band by coupling capacitors C105 and C108.

(4) 50 OHM. (See figure 4-7.) - With a resistive 50 ohm antenna system T102 is again utilized, and T101 is shorted. Dummy coil L101 is used with T102 to replace the AT-317/BRR loop and thus supply the inductance required in the resonant circuit. Capacitor C109 represents the loop cable capacitance of the AT-317/BRR antenna. The 50 ohm resistive antenna system is fed to terminals R and F of T102. In order to obtain optimum performance with the 50 ohm antenna, the compensating network consisting of resistor R102 and capacitor C107 is shorted out. The bandwidth is still greater than 1000 cps across the band due to the loading of the transformed 50 ohms. The 50 ohm impedance is transformed to the grid of the first RF amplifier (V201) by T102. With this transformed impedance, the unloaded impedance of T102 in conjunction with the noise equivalent resistance of V201 results in a receiver noise figure of approximately 1 db.

(5) WHIP OR WIRE. (See figure 4-8.) - When the whip antenna is used, dummy coil L101 and dummy capacitor C109 are connected as in the 50 ohm connection. The whip antenna is placed in series with the resonant circuit. The capacitance of the antenna and cable replaces capacitor C108. As the antenna capacitance is placed in series with the other capacitance of the resonant circuit, its value is not critical if greater than 1000 uuf. The Q compensating circuit consisting of resistor R102 and capacitor C107 is left in the circuit to maintain the RF bandwidth necessary for good impulse noise cancellation.

b. RF CIRCUITS. (See figure 4-2.) - Three double-tuned RF stages are employed to meet the demands of gain control range, selectivity, etc. The purpose of the RF circuits is to accept an input in the 14 to 30 kc region from any of the three antenna systems and to deliver an output to the mixer.

(1) TRF AMPLIFIER. (See figure 4-9.) - For good impulse noise cancellation the bandwidth of each resonant circuit is set to approximately 1000 cps at each frequency across the 14 to 30 kc band by a Q compensating parallel RC circuit placed in series with each coil.

Two types of coupling are employed in each stage in order to maintain correct coupling at each frequency in the 14 to 30 kc band. Capacitors C208 and C209 provide the two types of coupling.

This type of circuit has a large stage gain variation versus tuning. This gain variation is compensated for by varying the grid bias on TRF amplifier tubes V202 and V203. This is accomplished by frequency gain control (FGC) variable resistor R227, which is coupled to the RF TUNING control.

Referring to the first TRF stage in figure 4-9, each stage uses a double tuned circuit. The HL winding of transformer T201 and main tuning capacitor C201C comprise one resonant circuit of the double tuned stage. The associated Q compensating circuit consists of resistor R204 and capacitor C207. Temperature compensating capacitor C205 and trimming capacitor C206 complete the basic resonant circuit. Coupling capacitors C208 and C209 couple one resonant circuit to the second (identical to the first). The two transformer turns ratios are set to produce a stage gain of approximately 5 at 14 kc. The low pass filter, consisting of resistor R206 and capacitor C256 appearing at the grid of V202, and a similar

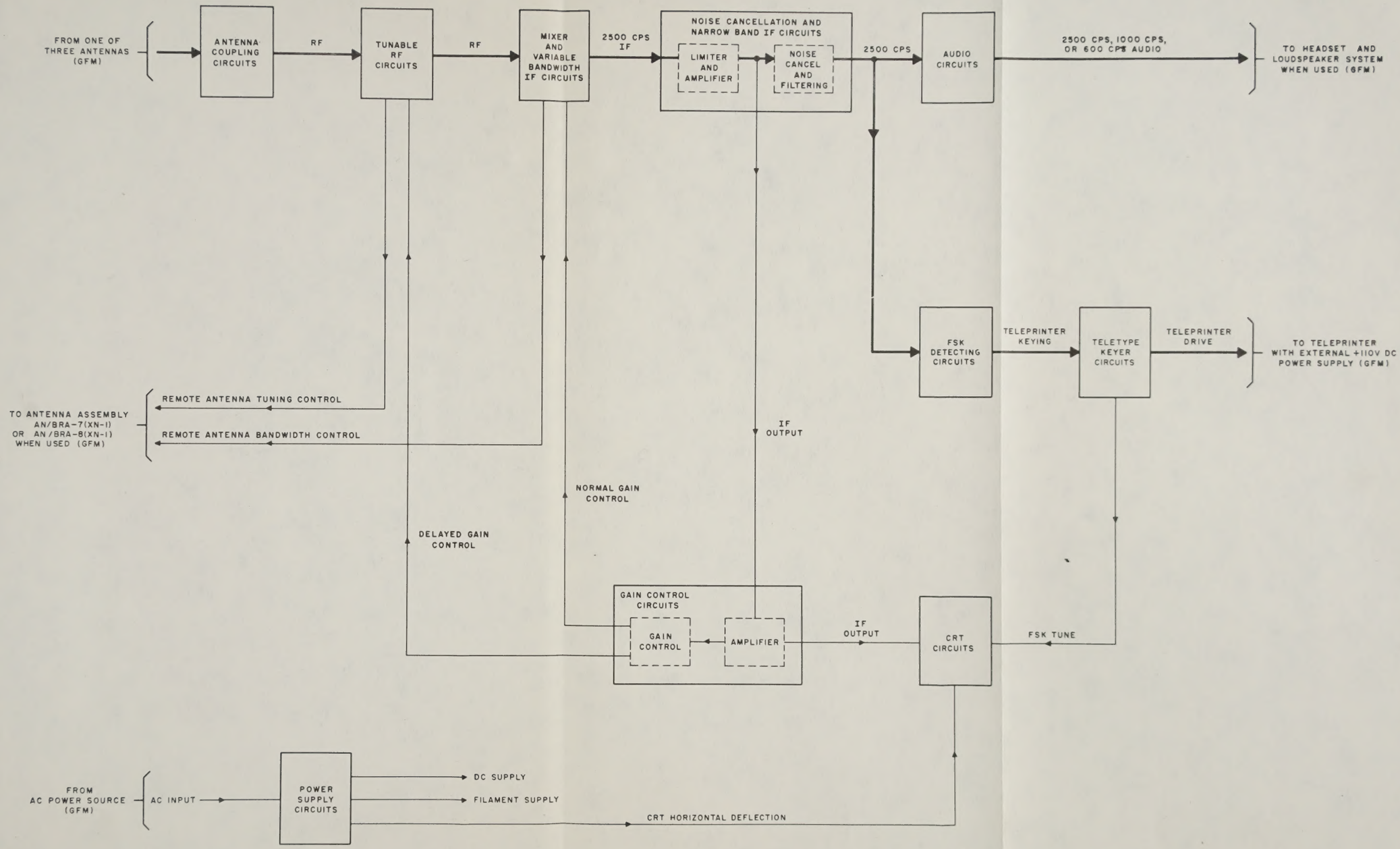


Figure 4-1. Radio Receiving Set AN/BRR-3, Block Diagram

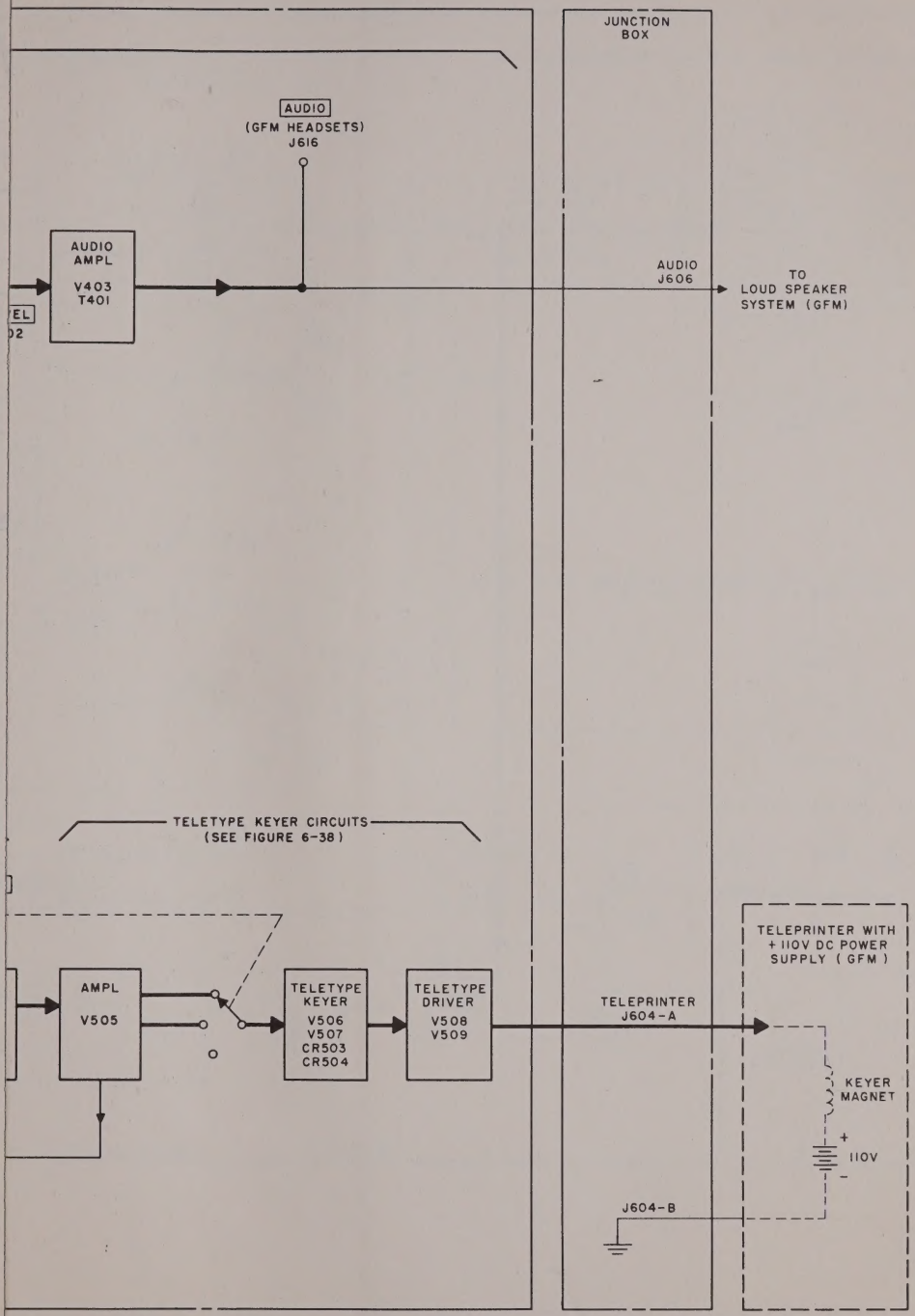


Figure 4-2. Radio Receiving Set AN/BRR-3, Functional Block Diagram

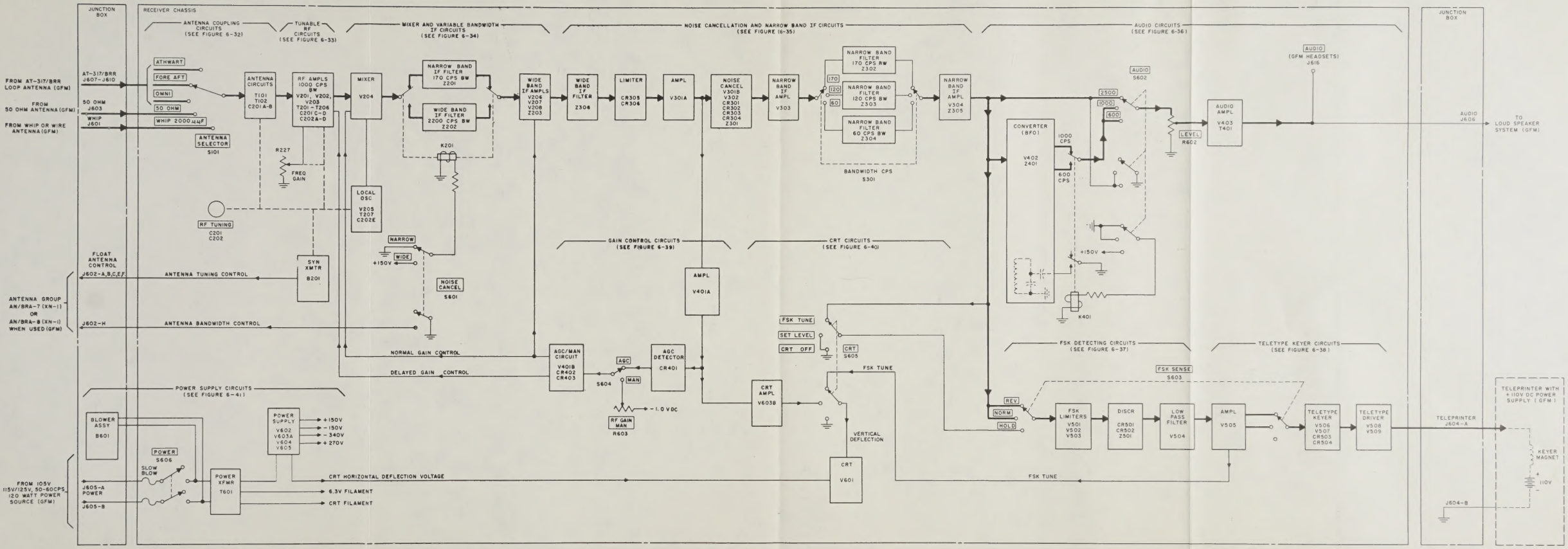


Figure 4-2. Radio Receiving Set AN/BRR-3, Functional Block Diagram

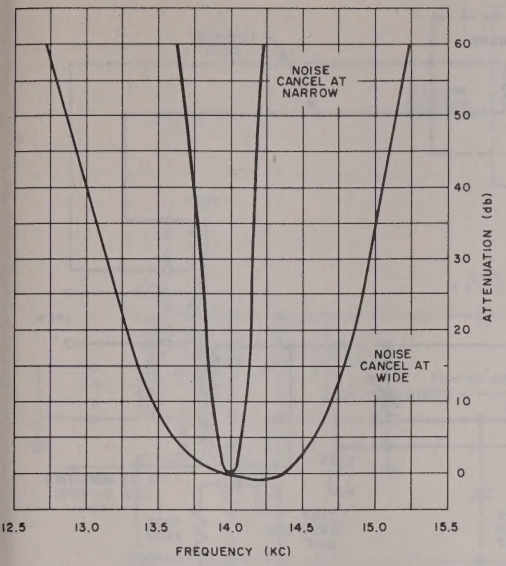


Figure 4-3. Prenoise Cancel RF-IF Selectivity

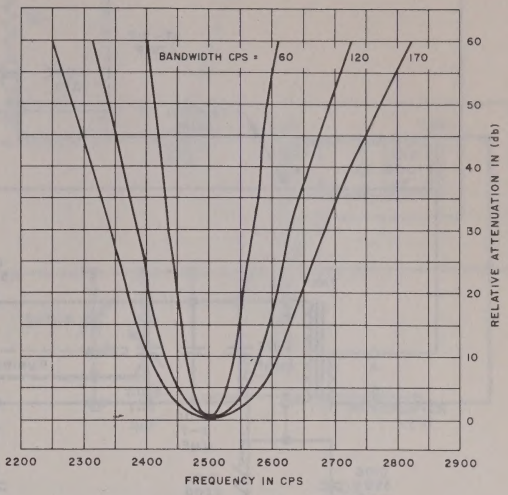


Figure 4-4. Postnoise Cancel IF Selectivity

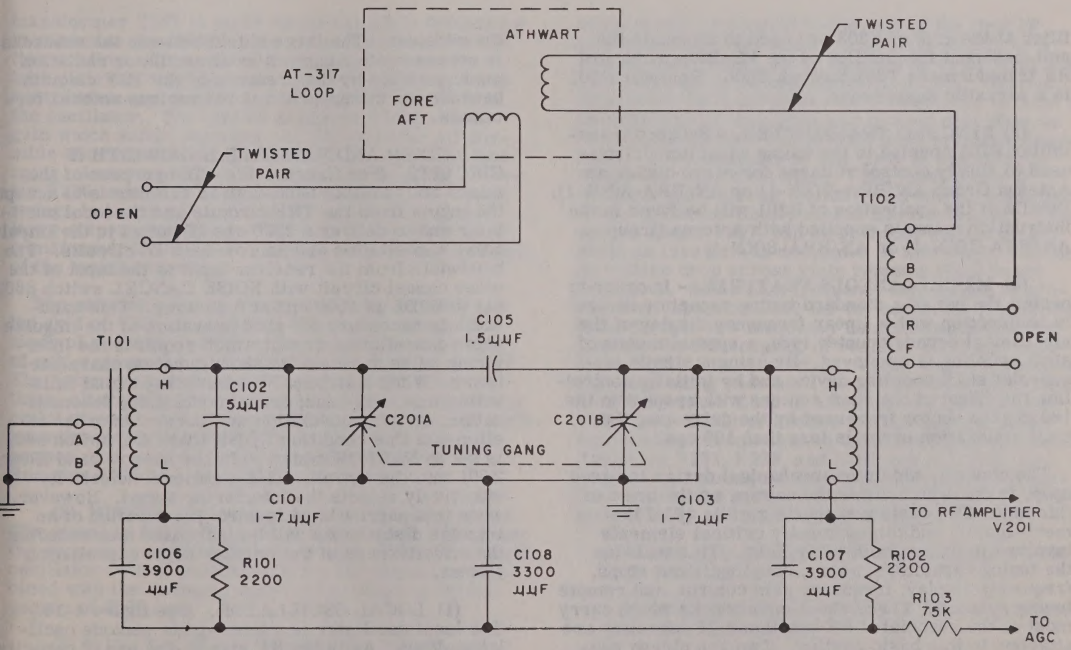


Figure 4-5. Antenna Selector Input Circuit, ATHWART Position

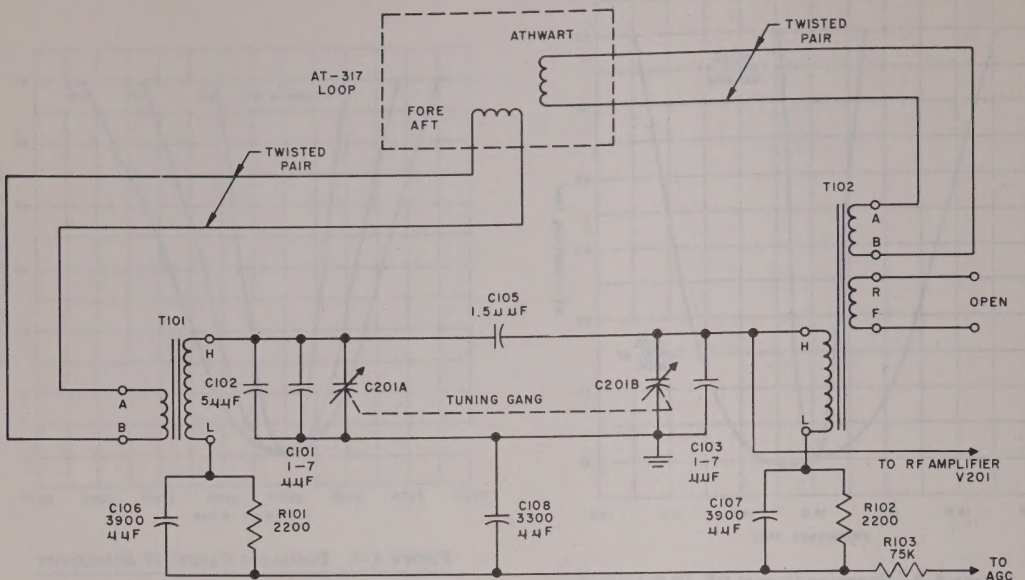


Figure 4-6. Antenna Selector Input Circuit, OMNI Position

filter at the grid of V203 are used to attenuate the self-resonant frequencies of the PG-BK windings of RF transformers T201 through T206. Resistor R201 is a parasitic suppressor.

(2) SYNCHRO TRANSMITTER. - Synchro transmitter B201 coupled to the tuning capacitor drive is used to supply control voltages for servo-tuning an Antenna Group AN/BRA-7(XN-1) or AN/BRA-8(XN-1). Details of the application of B201 will be found in the instruction manuals supplied with Antenna Group AN/BRA-7(XN-1) or AN/BRA-8(XN-1).

(3) MISCELLANEOUS FEATURES. - In order to permit the use of a standard tuning capacitor design in conjunction with a linear frequency display of the mechanical decade counter type, a special means of shaft coupling is employed. By using a simple pin-and-slot shaft coupling device and by initially controlling the offset of the shaft centers with respect to the 180 degree sector traversed by the drive-pin, the total calibration error is less than 100 cps.

The concept, which the mechanical design is based upon, is one which views the casting as the heart of this unit. The casting supports rigidly all of the mechanically and dimensionally critical elements involved in tuning from 14 to 30 kc. This includes the tuning capacitors, gears, coupling, limit stops, frequency display, frequency gain control, and remote tuning synchro. Three sheet metal decks which carry most of the associated RF oscillator-IF circuitry are attached to this basic casting. Two are hinged subdecks which contribute to the overall design intent of easy accessibility. The small shield at the end of the subdecks prevents detuning of the oscillator circuits when the aligned tuned RF circuits are assembled into the receiver. The large shield between the subdecks is necessary to suppress local oscillator radiation made possible by the presence of the TRF circuits between the mixer-grid and the various antenna terminals.

c. MIXER AND VARIABLE BANDWIDTH IF CIRCUITS. (See figure 4-2.) - The purpose of the mixer and variable bandwidth IF circuits is to accep the inputs from the TRF circuits and the local oscillator and to deliver a 2500 cps IF output to the impul noise cancellation and narrow band IF circuits. The bandwidth from the receiver input to the input of the noise cancel circuit with NOISE CANCEL switch S60 set to WIDE is 1000 cps at 6 db down. This bandwidth is necessary for good operation of the impulse noise cancellation circuit which requires the interfering noise to retain its short duration characteristics. When a strong CW interfering signal falls within this wide band; cross modulation, desensitization, or intermodulation will occur. In order to eliminate this condition NOISE CANCEL switch S601 is set to NARROW which switches narrow band filter Z201 into the circuit. This additional selectivity effectively rejects the interfering signal. However, when this narrow band is used, the duration of an impulse disturbance will be increased thus reducing the effectiveness of the impulse noise cancellation circuit.

(1) LOCAL OSCILLATOR. (See figure 4-10.) - The local oscillator is a tuned-plate pentode oscillator, V205. As in the RF stages, the use of capacit tuning at these low frequencies results in quite high resonant circuit impedances. To prevent lowering the Q of the circuit, the plate of the pentode is tappe down on the inductor. Similarly, grid winding GK on

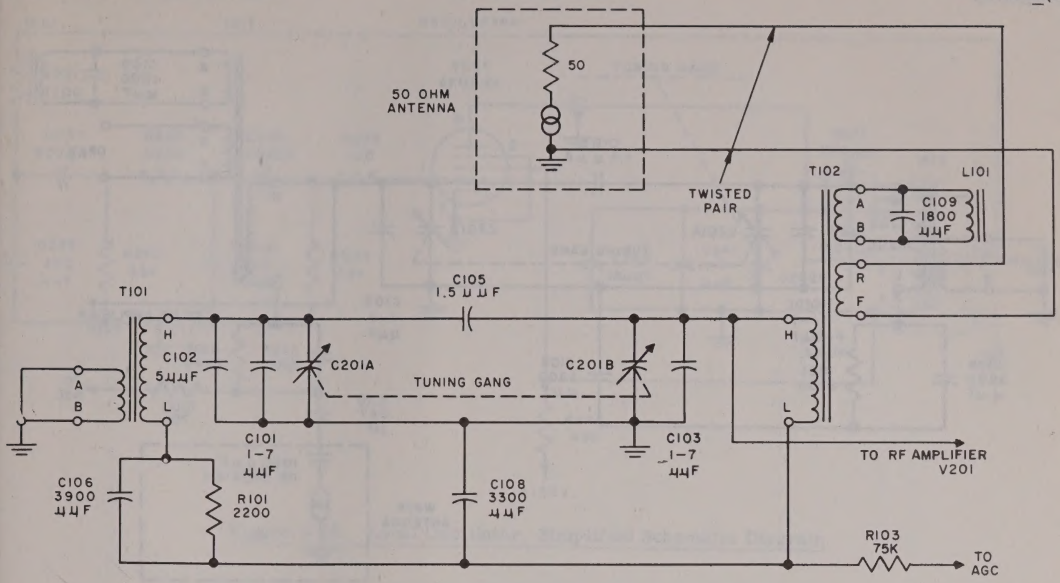


Figure 4-7. Antenna Selector Input Circuit, 50 OHM Position

transformer T207 is made small enough in inductance to minimize the effect of the impedance connected to this winding. This procedure of tapping down the tube plate and tube grid on the main resonant circuit contributes appreciably to the frequency stability of the oscillator. The circuit design provides a loop gain which safely supports oscillation under all possible combinations of environment, voltage, and tube aging. Low temperature-drift series dropping resistor R226 is used to restrict the maximum ac voltage swings in the oscillator tank circuit in view of the large step-up between the T-L and H-L terminals of transformer T207 and the limited peak voltage ratings of the tuning capacitor.

The network between the grid winding of T207 and the grid of V205 is needed to eliminate a spurious mode of operation which is possible at the frequency of self-resonance of the tapped portion (T-L) of T207. The network consists of four cascaded RC filter sections, alternately low pass and high pass, designed for small attenuation and small phase shift within the oscillator frequency range of 16.5 to 32.5 kc (0.5 db per section, and zero degrees overall, at 23.1 kc). Resistor R225 is a parasitic suppressor.

(2) MIXER. - This stage is a conventional mixer. The signal is fed to the grid of mixer stage V204 from the secondary winding of transformer T206. The local oscillator (with a frequency above the signal) is combined with the incoming signal to produce an IF frequency of 2500 cps.

(3) WIDE BAND IF AMPLIFIERS. (See figure 4-11.) - The IF circuits incorporated into the mixer and variable bandwidth IF circuits include three stages of IF amplification (V206, V207, and V208). The plate of the mixer is coupled to the grid of the first IF amplifier via either a wide band filter, Z202, or a narrow band filter, Z201, selected by relay K201 and controlled by the NOISE CANCEL switch. Narrow band filter Z201 provides sharp selectivity in front of the high gain IF amplifier and is used only when an interfering carrier makes wide band operation impossible. The remainder of this first IF amplifier is wide band. The first stage, V206, uses a low Q resonant plate circuit loaded by a resistor contained within the hermetically sealed filter container. The second stage, V207, can be operated without an LC shunt as less gain is demanded of this stage, and the dc voltage drop across plate resistor R239 is not excessive. Some high frequency attenuation is provided by capacitor C251 for the oscillator frequency. Some further low frequency hum attenuation is supplied by the RC coupling of resistor R241 and capacitor C253. The third stage, V208, works at relatively high gain using wide band filter Z306 as a plate load. Wide band filter Z306 is identical to Z202 and provides (with Z202) protection for the impulse noise cancellation circuit against local oscillator frequency. Resistors R233, R238, and R243 are parasitic suppressors. Loading resistors for Z201 and Z202 are contained in the hermetically sealed container. Resistors R231 and R236 are grid leak resistors.

d. NOISE CANCELLATION AND NARROW BAND IF CIRCUITS.

(1) IMPULSE NOISE CANCELLATION CIRCUIT. (See figure 4-12.)

(a) GENERAL. - The signal being received is fed from the wide band IF amplifier into a phase splitter. There are two separate outputs from the

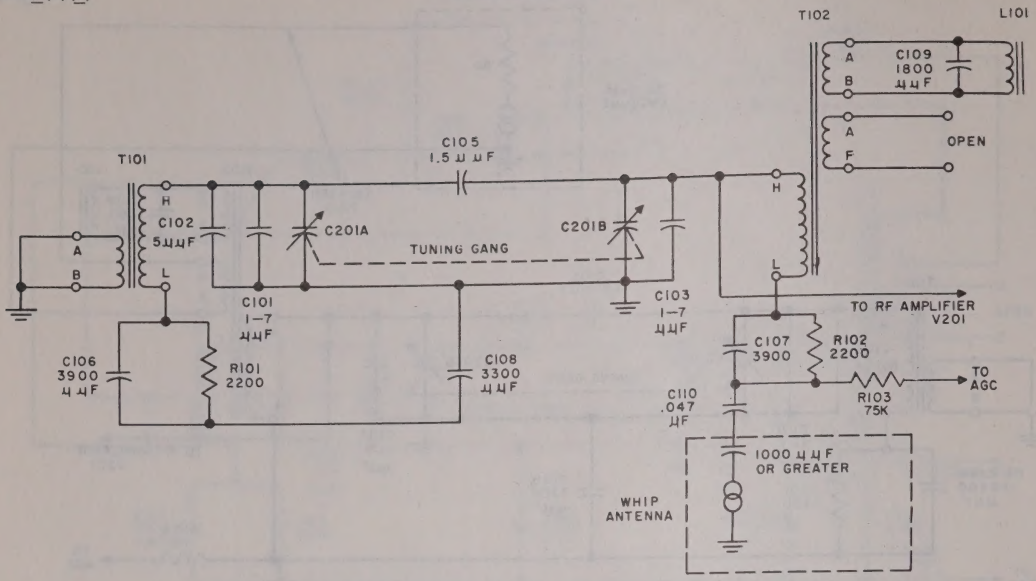


Figure 4-8. Antenna Selector Input Circuit, 2000 MMF Position

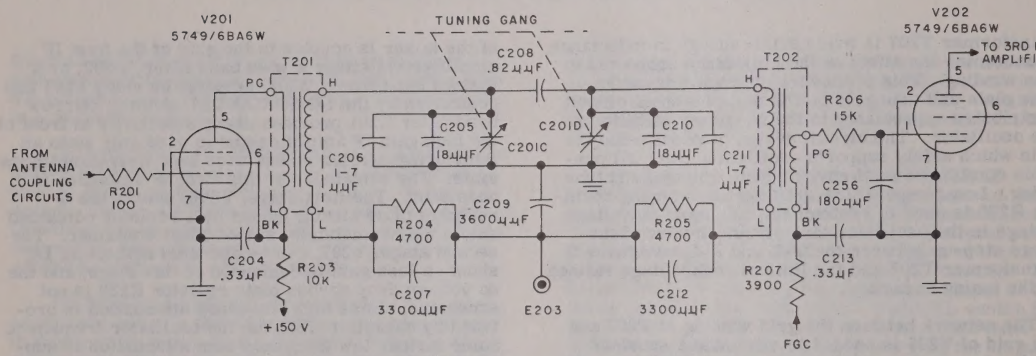


Figure 4-9. One TRF Stage, Simplified Schematic Diagram

phase splitter which are approximately equal in amplitude and 180 degrees out of phase with one another. One output goes through a gate network. The gate has the characteristic of passing signals which are greater in amplitude than the threshold level of the gate and rejecting all other signals. Signals passed by the gate are fed through adding resistor R312 to point X shown in figure 4-12. The other output from the phase splitter is fed by a direct path, through adding resistor R317, to this same point. The signal, which appears at point X, is the algebraic sum of the two paths and is fed to narrow band IF amplifier V303. In order to enable proper adjustment of the amplitude and phase relationship of the two paths, a phase adjusting and amplitude adjusting network is included in the circuit.

When a signal is being received, the gain of the receiver is set so that the standard level of the desired signal is just below the threshold of the gate. If there are no noise impulses present in the signal, the signal at point X is then merely the signal from the direct path, since the gated path blocks all signals below the gate threshold. When a large noise impulse is received in addition to the signal, the resulting instantaneous voltage which is greater than the threshold level is passed by the direct and gated paths. The signal at point X is equal to the signal from the direct path minus the signal from the gated path (180 degree phase difference). It is desirable to have this resultant at zero for the duration of the noise pulse; actual zero output cannot be obtained, but the carrier frequency component of this algebraic sum is quite

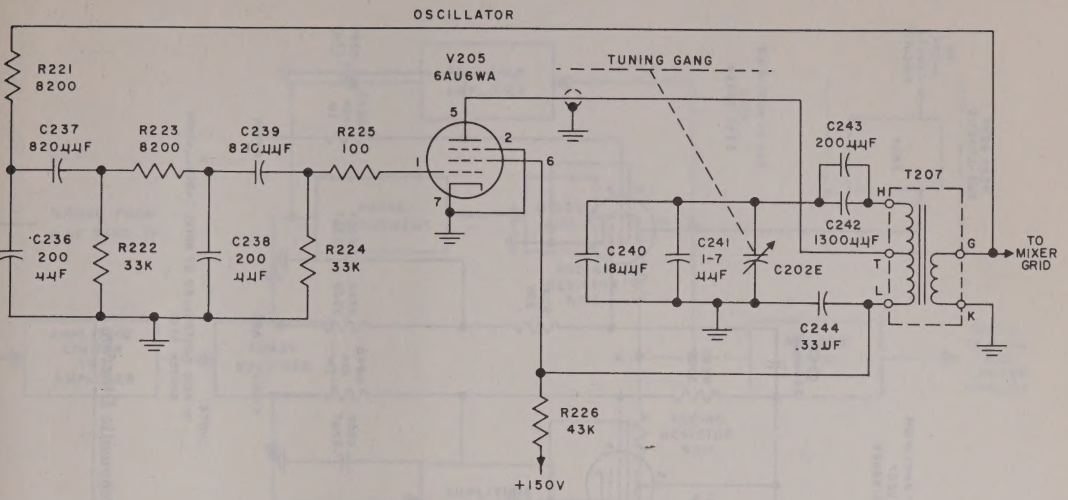


Figure 4-10. Local Oscillator, Simplified Schematic Diagram

reduced compared to its standard signal level value. Therefore, when this resultant at point X is fed to the narrow band filter as shown in figure 4-12, the effect of the impulse is to punch a hole in the output signal from the narrow band filter during the impulse interval.

The instantaneous frequency error due to impulse noise is also greatly reduced by this circuit which results in improved teletype reception, since the dc voltage output of the discriminator circuit is a direct function of frequency.

One of the limitations of the noise cancellation circuit is that an interfering adjacent channel signal, which is inside the prenoise cancel bandwidth and is stronger than the desired signal, has the same effect on the circuit as impulse noise when the NOISE CANCEL switch is in the WIDE position, that is, desired signal desensitization will result. Setting the NOISE CANCEL switch to the NARROW position will reject this interfering adjacent channel signal.

In order to further improve the output signal to impulse noise ratio, a narrow band feedback circuit using feedback amplifier V302 feeds the signal only from the output of the noise cancellation circuit back to the input side of the gate. The magnitude and phase of this signal feedback is such that the signal voltage at the input side of the gate is reduced by 10 db. Standard signal level to phase splitter V301B can thus be increased by 10 db in order to again bring the signal level in the gated path up to the gate threshold.

This procedure automatically increases the signal output of the direct path by 10 db; and since the impulse noise output is increased negligibly, an appreciable improvement in output signal to impulse noise ratio is obtained.

A diode limiter consisting of CR305 and CR306 is used before the impulse noise cancellation circuit to limit the level of interfering pulses to 14 db above the level of the desired signal.

(b) CIRCUIT DESCRIPTION. (See figure 4-13.) The phase splitter is one section of a 5814A dual triode (V301B). The gated path output from the phase splitter is taken from plate load resistor R309 which is connected from the plate to an ac ground of plus 150 volts. Circuit wiring provides correct phasing at point X. The gate consists of two 1N459 silicon diodes, CR301 and CR302. The diodes have a built in back potential of approximately 0.3 volt and will not conduct until the plate to cathode voltage exceeds that voltage. If the instantaneous value of the voltage applied to the input to the gate does not exceed either plus or minus 0.3 volt, neither CR301 nor CR302 conducts. If the voltage applied is more positive than 0.3 volt, CR301 conducts; if the voltage applied is more negative than 0.3 volt, CR302 conducts. Therefore, the threshold of the gate is 0.6 volt peak-to-peak. When the input signal to the gate is less than 0.6 volt peak-to-peak, none of the input voltage is passed by the gate. When the input signal to the gate exceeds 0.6 volt peak-to-peak, the voltage which would appear across a linear load at the output of the gate is the input signal with a portion (±0.3 volt) sliced out of the center, due to the limiting action of diodes CR301 and CR302. For optimum cancellation of impulse disturbances, the signal from the gate should be a linear reproduction of the input voltage. This cannot be accomplished when gating is performed, but the desired result can be approximated by using a nonlinear load, for the gate, which decreases in value as the voltage across it increases. The series-parallel combination of resistors R310 and R311, and diodes CR303 and CR304 supplies this type of nonlinear load. Resistor R312 is the adding resistor for this gated path.

The direct path output from the phase splitter is taken from the cathode of V301B. The amplitude

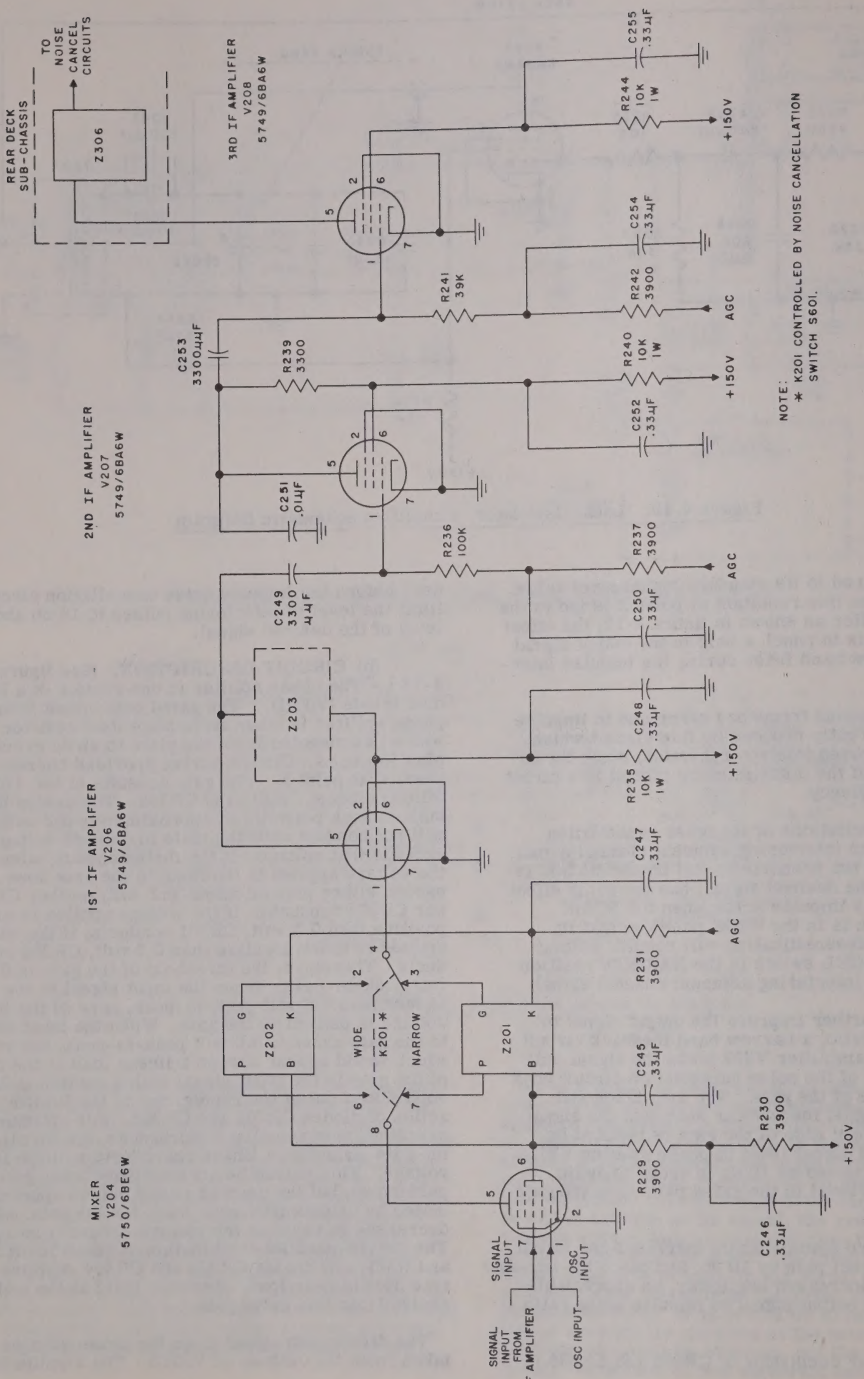


Figure 4-11. Variable Bandwidth IF Amplifier, Simplified Schematic Diagram

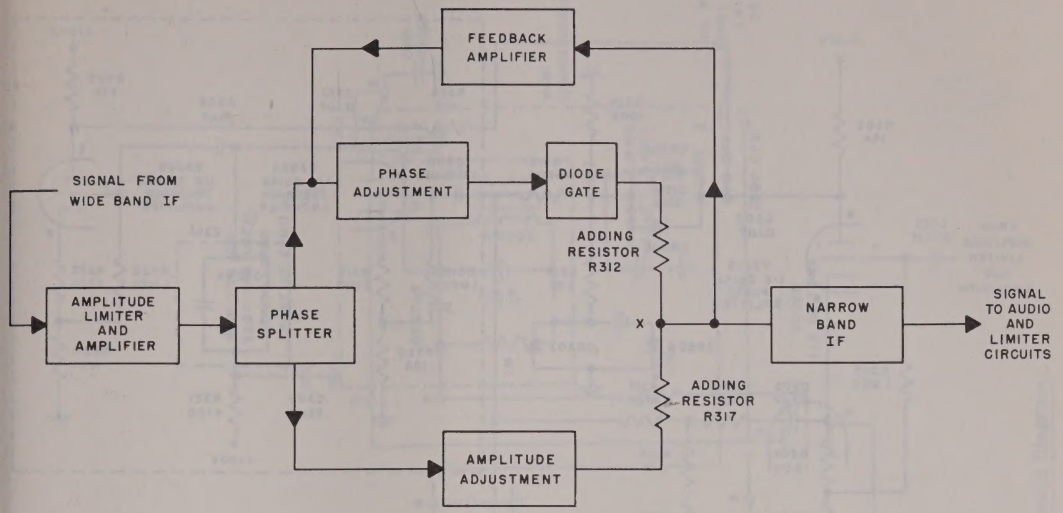


Figure 4-12. Impulse Noise Cancellation Circuit, Block Diagram

djusting network consists of resistors R314, R315, nd R316. Resistors R315 and R316 are used in eries (instead of one) to enable the output amplitude o be set accurately using standard value resistors. he value of resistor R315 is the nearest standard alue which is less than the total required resistance. he remainder of the required resistance is supplied y resistor R316. Resistor R317 is the adding resis- or for this direct path.

The narrow band feedback amplifier is a 2-stage mplifier. The first stage, V302A, has a plate load, 301, which is tuned to 2500 cps and has a 3 db band- idth of 100 cps. The second stage is an RC coupled mplifier which provides additional gain and increases he total phase shift of the amplifier to 360 degrees. esistors R320 and R324 provide negative feedback n each stage for gain stability, and resistor R326 is he adding resistor which supplies the feedback signal o the input side of the gate.

(2) NARROW BAND IF AMPLIFIER. (See figure -14.) - Following the impulse noise cancellation ircuit is the narrow band IF section consisting of hree filters with 6 db bandwidths at 170, 120, and 60 ps. The filters, Z302, Z303, and Z304, respectively, ave a linear phase characteristic and have shape actors (60 to 6 db bandwidth ratio) of 3.6 to 1. BAND IDTH CPS switch S301 controls the selection of hese filters.

The linear phase design is used since it minimizes ny overshoot (ringing) in the filter output. The tubes sed in the narrow band IF are V303 and V304. The utput of V304 is fed to wide band tuned circuit Z305 nd then to the audio and FSK limiter circuitry. The ath to FSK limiting circuitry is through FSK SENSE witch S603 and CRT switch S605. The switching is rranged so that the FSK detecting circuits are dis- connected from the narrow band IF when the FSK SENSE switch is in the HOLD position and the CRT switch is simultaneously in the SET LEVEL position.

e. AUDIO CIRCUITS.

(1) CONVERTER. (See figure 4-15.) - The converter is used to convert the IF frequency of 2500 cps to a frequency of either 1000 or 600 cps. This is accomplished by producing a local oscillator frequency of 3500 or 3100 cps, respectively. The 2500 cps signal is fed to the grid of V402A from the narrow band IF at Z305 via isolating resistor R411.

Setting AUDIO switch S602 to 2500 cps will bypass relay K401 and filter Z401. The narrow band IF output is capacity coupled to AUDIO-LEVEL control R602 and fed to audio amplifier V403A via the center arm of R602. Setting AUDIO switch S602 to 1000 cps will not energize relay K401; but the audio output will be taken from the 1000 cps output terminal, pin 8, of Z401, through pins 3 and 4 of K401, to AUDIO-LEVEL control R602 and fed to audio amplifier V403A via the center arm of R602. Setting AUDIO switch S602 to 600 cps energizes relay K401, effectively adding capacitance to the local oscillator circuit which lowers the frequency output. This is accomplished via pins 6 and 8 of K401. The 600 cycle output is taken from pin 9 of Z401, through pins 2 and 4 of K401, to AUDIO-LEVEL control R602 and fed to audio amplifier V403A via the center arm of R602.

(2) AUDIO AMPLIFIERS. (See figure 4-16.) - When AUDIO switch S602 is set to 2500, the 2500 cps output of the narrow band IF amplifier is fed to the input of audio amplifier V403A through C601, R602 (AUDIO-LEVEL control), and R421. At this time S602 grounds the output of the converter. When S602

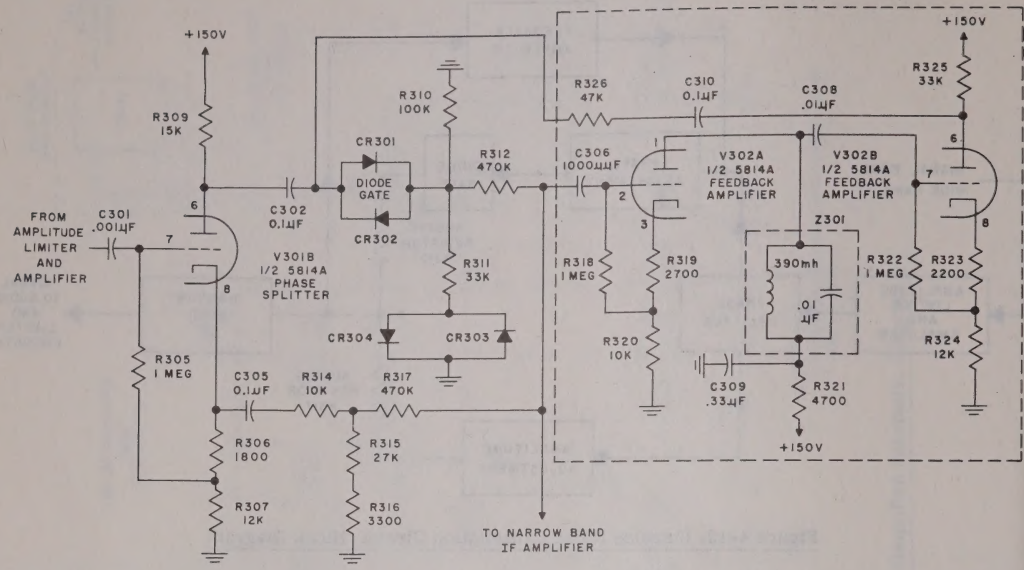


Figure 4-13. Impulse Noise Cancellation Circuit, Simplified Schematic Diagram

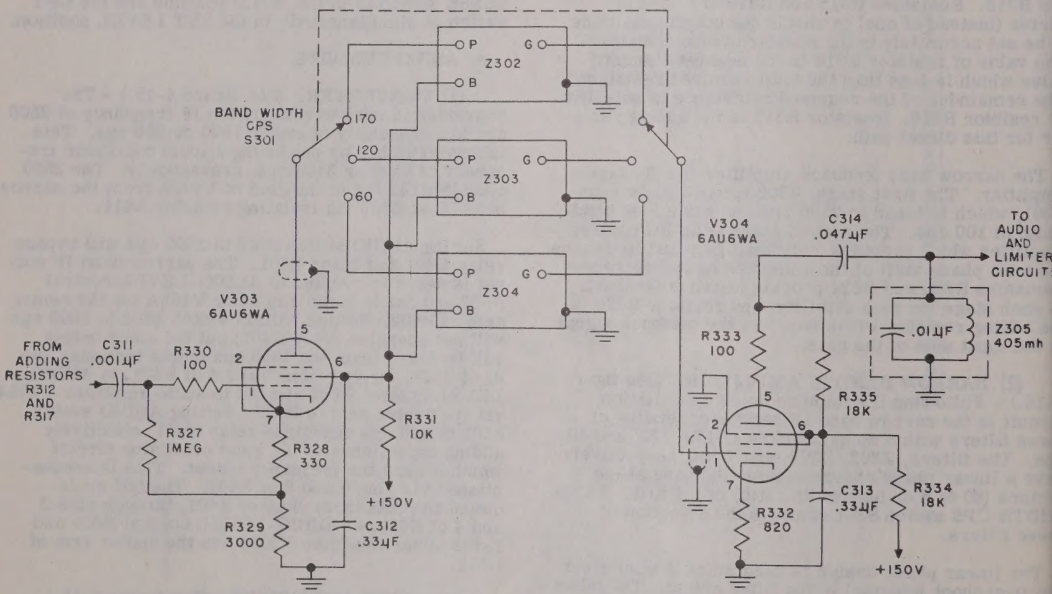


Figure 4-14. Narrow Band IF Amplifiers, Simplified Schematic Diagram

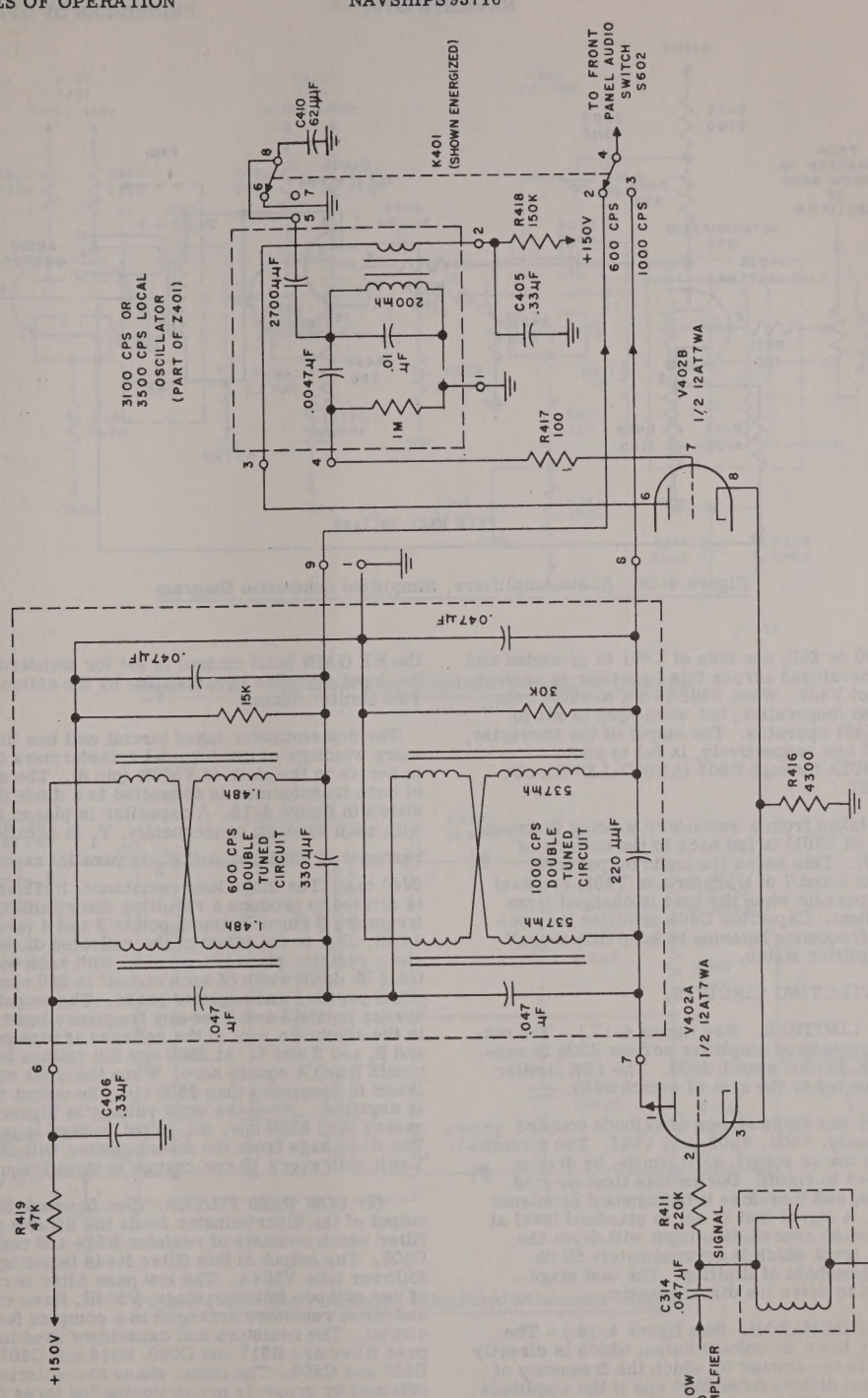


Figure 4-15. Converter, Simplified Schematic Diagram

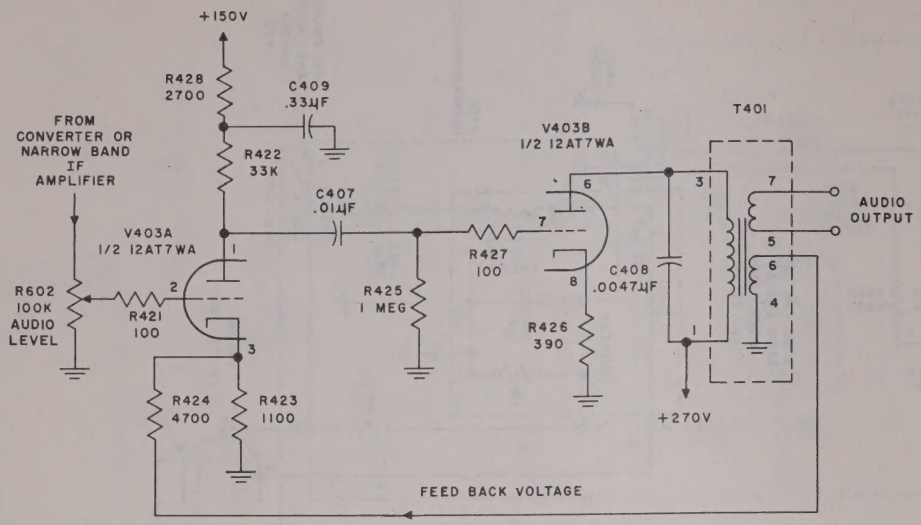


Figure 4-16. Audio Amplifiers, Simplified Schematic Diagram

is set to 1000 or 600, one side of C601 is grounded and the voltage developed across this capacitor is applied to the input of V402. When S602 is set to 1000, relay K401 remains inoperative; but when S602 is set to 600, relay K401 operates. The output of the converter, 1000 and 600 cps respectively, is fed to audio amplifier V403A through R602 (AUDIO-LEVEL control) and R421.

A voltage taken from a secondary winding (between pins 4 and 6 of T401) is fed back to the cathode of V403A (pin 3). This keeps the audio output level (between pins 5 and 7 of transformer T401) constant to within 10 percent when the load is changed from 600 to 200 ohms. Capacitor C408 provides the necessary high frequency filtering to keep this overall feedback amplifier stable.

f. FSK DETECTING CIRCUITS.

(1) FSK LIMITERS. (See figure 4-17.) - The output of the narrow band amplifier across Z305 is connected to FSK SENSE switch S603. The FSK limiter input is connected to the arm of switch S603.

The limiter has three stages of cathode coupled clippers; namely, V501, V502, and V503. The circuit center slices the ac signal, as it limits, by driving alternate tubes to cutoff. During this time no grid current flows, and therefore time constant problems are avoided. A signal that is set to standard level at the impulse noise cancellation input will drive the limiters to a level which is approximately 50 db above their threshold of limiting. The last stage, V503, is used to drive the discriminator.

(2) DISCRIMINATOR. (See figure 4-18.) - The discriminator has a dc voltage output which is directly proportional to the amount by which the frequency of the input signal differs from 2500 cps if the amplitude is kept constant. When a signal is being received and the RF GAIN MAN control is set for standard level, the input signal is kept constant by the action of the FSK limiter chain.

The discriminator tuned circuit unit has the primary windings of two toroidal transformers connected in series in the plate of V503B (pin 6). The secondary of each transformer is connected to a diode detector as shown in figure 4-18. A capacitor is placed in parallel with each winding; consequently, T_1 is parallel resonant at 2280 cps, and T_2 is parallel resonant at 2740 cps. The diode load resistance, R512 and R513, is divided to produce a resulting discriminator versus frequency S curve between points 3 and 4 (see figure 4-19). Due to the effect of the reflected diode load and a resistor placed in parallel with each winding, the 3 db down width of each circuit is 250 cps and has equal positive and negative peaks. The output voltage across points 3 and 4 for any frequency input is equal to the algebraic sum of the voltages across points 3 and 2, and 2 and 4. At 2500 cps the voltage between points 3 and 4 equals zero. When the input voltage is lower in frequency than 2500 cps, the output voltage is negative. When the input voltage is higher in frequency than 2500 cps, the output voltage is positive. The dc voltage from the discriminator will change 1 volt with every 10 cps change in input frequency.

(3) LOW PASS FILTER. (See figure 4-20.) - The output of the discriminator feeds the RC low pass filter which consists of resistor R514 and capacitor C505. The output of this filter feeds isolating cathode follower tube V504A. The low pass filter is comprised of one cathode follower stage, V504B, three capacitors, and three resistors arranged in a complex feedback circuit. The resistors and capacitors used in the low pass filter are R517 and C509, R518 and C507, and R520 and C508. The linear phase characteristic is obtained by properly proportioning the three RC time

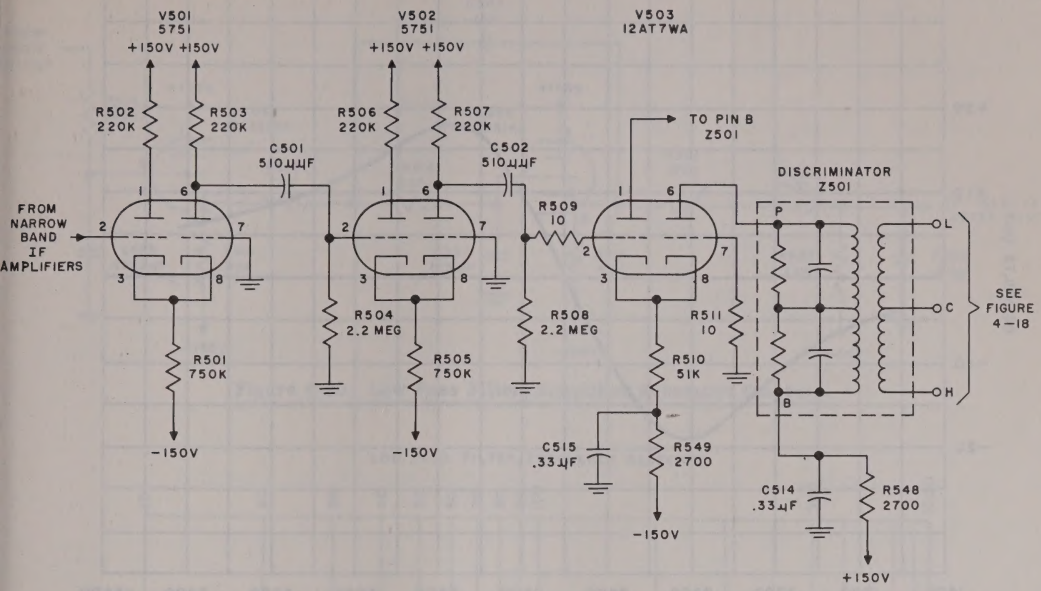


Figure 4-17. FSK Limiters, Simplified Schematic Diagram

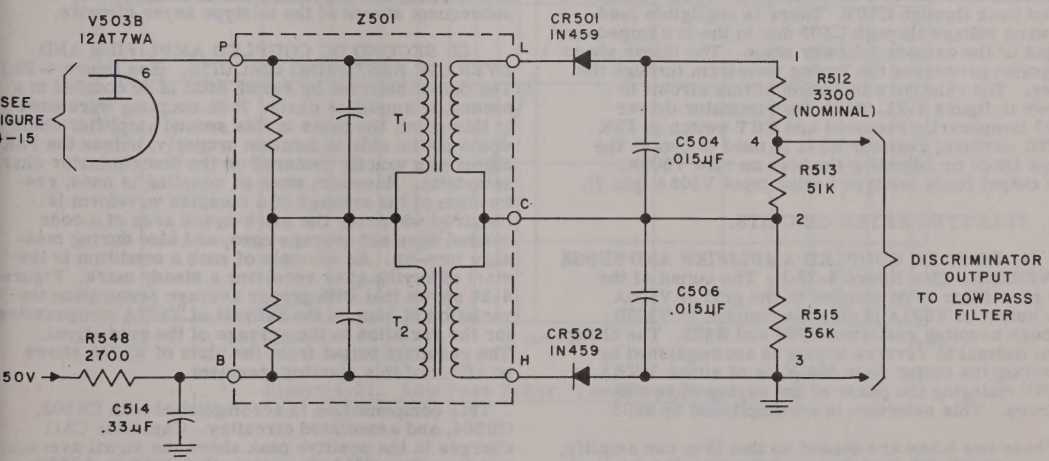


Figure 4-18. Discriminator, Simplified Schematic Diagram

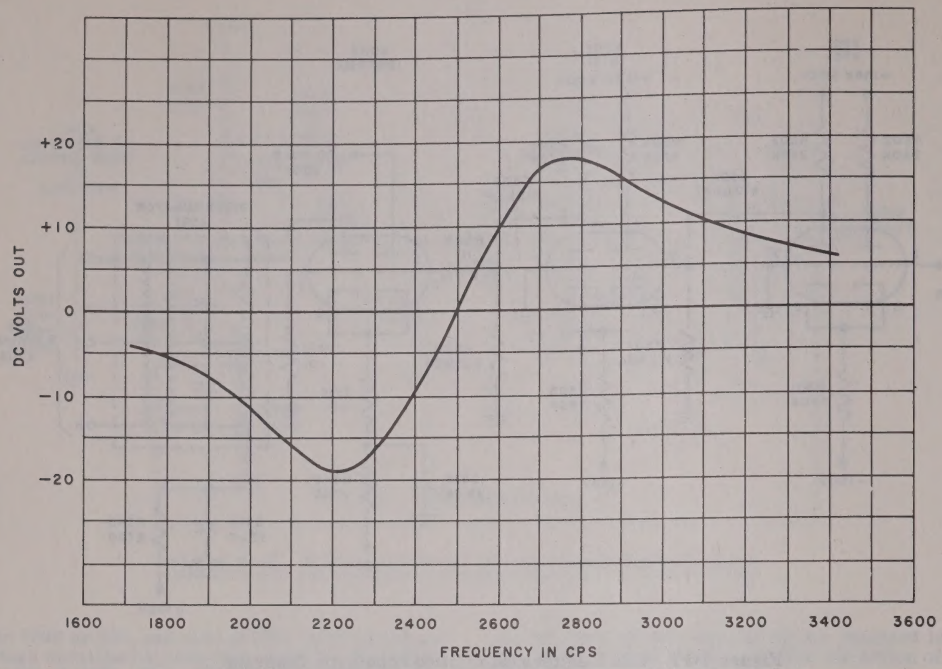


Figure 4-19. Discriminator Characteristic

constants involved and the amount of voltage which is fed back through C509. There is negligible feed-forward voltage through C509 due to the low impedance output of the cathode follower stage. The linear phase response preserves the keying waveform through the filter. The relative attenuation of this circuit is shown in figure 4-21. With discriminator driver V503 temporarily removed and CRT switch in FSK TUNE position, resistor R521 is used to center the scope trace by adjusting the bias on tube V505A. The output feeds teletype keying input V505A (pin 2).

g. TELETYPE KEYER CIRCUITS.

(1) FIRST DC COUPLED AMPLIFIER AND SENSE REVERSER. (See figure 4-22.) - The output of the low pass filter is dc coupled to the grid of V505A. The output of V505A is directly coupled to V505B through coupling resistors R524 and R525. The change from normal to reverse keying is accomplished by selecting the output from the plate of either V505A or V505B changing the phase of the keying wave 180 degrees. This selection is accomplished by S603.

These two tubes are biased so that they can amplify, with negligible teletype timing distortion, the dc coupled discriminator output waveform. This good performance occurs even if the FSK signal is not properly centered on the discriminator characteristic due to an operator's maladjustment of the RF TUNING control. Because it is desirable to feed the teleprinter magnet sharp-sided signal waveforms with negligible timing uncertainty, additional amplification and clipping are necessary and are supplied by the subsequent stages of the teletype keyer circuits.

(2) SECOND DC COUPLED AMPLIFIER AND AVERAGE RESTORING CIRCUITS. (See figure 4-23.) The output selected by switch S603 is ac coupled to a second dc amplifier chain. If dc coupling were used at this point, the tubes in this second amplifier chain would not be able to function properly, unless the FSK signal was exactly centered on the discriminator characteristic. However, when ac coupling is used, restoration of the average of a complex waveform is required whenever the mark-space area of a code symbol does not average zero, and also during message turn-on. An example of such a condition is the start of keying after receiving a steady mark. Figure 4-24 shows that with proper average restoration the variation of bias on the cathode of V507A compensates for the variation in the average of the grid signal. The resultant output from the plate of V507A shows no effect of this starting transient.

This compensation is accomplished with CR503, CR504, and associated circuitry. Capacitor C511 charges to the positive peak above the signal average, and capacitor C512 charges to the negative peak below the signal average. These two dc voltages are algebraically added by resistors R530 and R532, and the resultant is fed to the grid of cathode follower bias coupling tube V506B (pin 7); this algebraic resultant is the proper average-restoring bias voltage. Concurrently, the total keying wave is fed to the grid of cathode follower signal coupling tube V506A (pin 2)

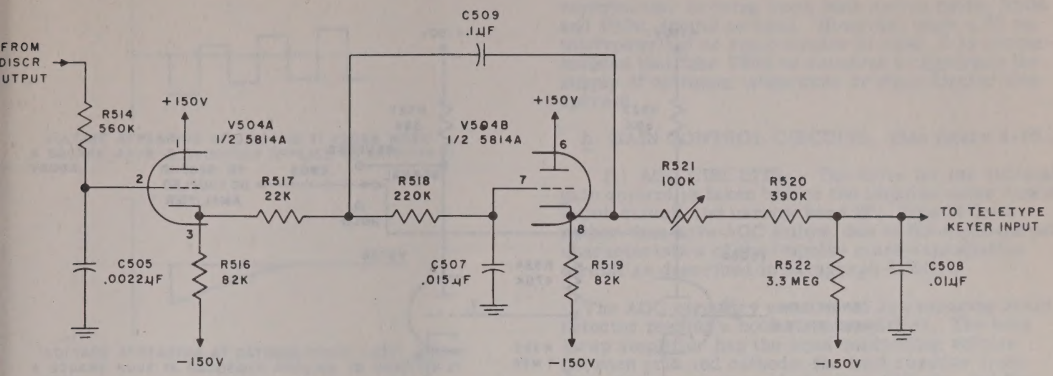


Figure 4-20. Low Pass Filter, Simplified Schematic Diagram

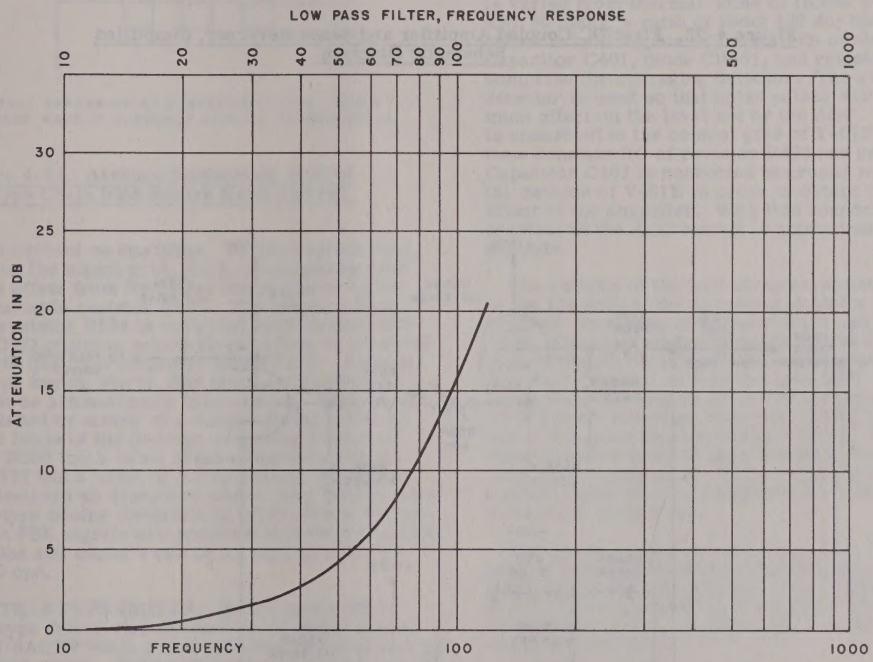


Figure 4-21. Low Pass Filter, Frequency Response

om V505A or V505B depending upon the setting of witch S603. These coupling tubes handle large grid wings without drawing grid current, since any grid urrent would charge capacitors C510 or C511 and 512 and destroy the proper bias relationships.

The total signal is then fed to the grid of combiner-mplifier tube V507A, and the dc average restoring as voltage is fed to the cathode of V507A.

In order to provide sharp-sided signal waveforms with negligible timing uncertainty, the combined output is further dc amplified and clipped by V507B (see figure 2-24). The second DC coupled amplifier and average restoring circuits also function as a mark hold circuit.

Whenever a long mark signal is being received, teletype keyer tubes V508 and V509 should be held in

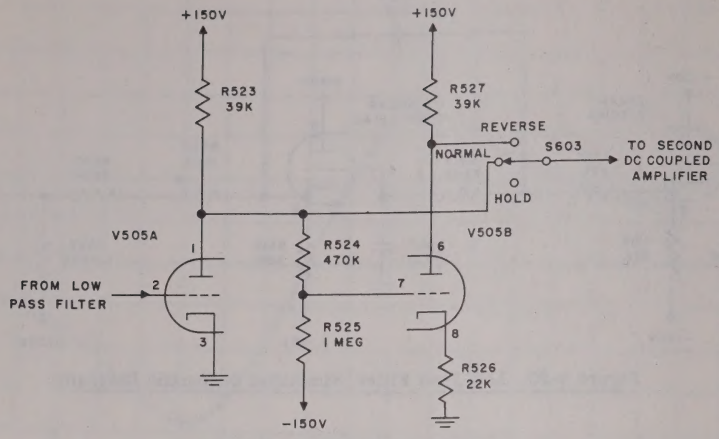


Figure 4-22. First DC Coupled Amplifier and Sense Reverser, Simplified Schematic Diagram

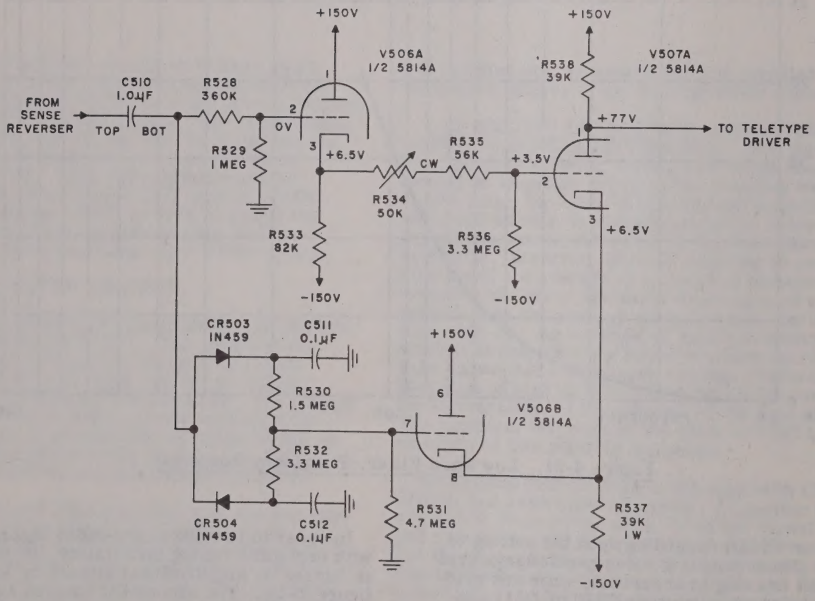
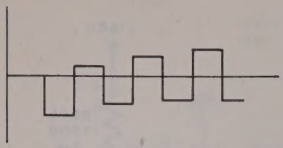
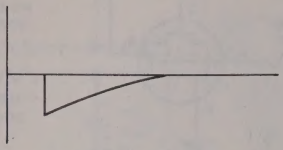


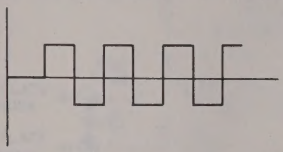
Figure 4-23. Second DC Coupled Amplifier and Average Restorer Circuits, Simplified Schematic Diagram



VOLTAGE APPEARING AT GRID(PIN 7) V505B WHEN A SQUARE WAVE IS SUDDENLY APPLIED TO GRID(PIN 2) V505A.



VOLTAGE APPEARING AT CATHODE(PIN 3) V507 WHEN A SQUARE WAVE IS SUDDENLY APPLIED TO GRID(PIN 2) V505A.



VOLTAGE APPEARING AT PLATE(PIN 1) V507 WHEN A SQUARE WAVE IS SUDDENLY APPLIED TO GRID(PIN 2) V505A.

Figure 4-24. Average Restoration Part of Teletype Chain With Square Wave Applied

their full current on condition. To accomplish this, the bias on the signal grid, pin 2, of combining tube V507A is offset from its center-biased value by adjusting variable resistor R534. The proper adjustment of resistor R534 is such that, with switch S603 in the HOLD position, minus 10 volts bias is produced at the grid (pin 7) of amplifier tube V507B. As soon as teletype keying starts, this mark-hold offset bias must be automatically balanced out. This is accomplished by means of a compensating offset in the diode loads of the average-restoring circuitry; resistor R530 has a value of 1.5 megohms, and resistor R532 has a value of 3.3 megohms. With the circuit designed as described above, less than 10 percent teletype timing distortion is produced by the circuit when FSK signals are received with deviations as low as plus and minus 5 cps or as high as plus and minus 50 cps.

(3) TELETYPE DRIVER. (See figure 4-25.) - The teletype driver circuit consists of either one or two 6005/6AQ5W beam power pentodes gated on and off by the input signal. Output current is keyed on and off by the plates of V508 and V509 (pin 5) connected in series with the teleprinter loop circuit, which has in series with it an external power supply of 110 vdc, 20 or 60 ma depending upon the particular teletypewriter being driven.

Each teletype driver tube has its own screen dropping resistor, R545 and R546, connected to the plus 150 volt regulated supply. The value of the dropping resistor causes 30 ma to flow through each drive tube when its grid is driven to zero volt bias by the keyer chain. Therefore, when a 60 ma teletypewriter or reperforator is being used, both driver tubes, V508 and V509, should be used. However, when a 20 ma teletypewriter or reperforator is used, it is recommended that tube V509 be removed to approach the supply of optimum teleprinter or reperforator line current.

h. GAIN CONTROL CIRCUITS. (See figure 4-26.)

(1) AGC CIRCUITS. - The drive for the automatic gain control is taken before the impulse noise cancellation circuit and narrow band IF. This is done rather than have AGC follow, due to the input-output characteristics of the impulse noise cancellation circuit as described in paragraph 4-2d(1).

The AGC circuitry consists of an averaging shunt detector feeding a boot strap amplifier. The boot strap amplifier has the input controlling voltage between grid and cathode, the load resistor from cathode to an ac ground of minus 150 vdc, and the plate to an ac ground of plus 150 vdc. The amplifier supplies a dc voltage from its cathode which is at a potential close to ground. When the receiver input is varied from thermal noise to 10,000 uv in series with 50 ohms, a ratio of about 120 db; the receiver output is held to plus or minus 3 db of standard level. Capacitor C401, diode CR401, and resistor R401 comprise the averaging detector. The averaging detector is used so that noise pulses will have minimum effect on the level set by the AGC. This detector is connected to the control grid of V401B through the time constant RC of resistor R402 and capacitor C403. Capacitor C403 is connected to ground rather than to the cathode of V401B in order to obtain the multiplying effect of the amplifier. With this connection the time constant of the AGC circuit is approximately 2.2 seconds.

The cathode of the boot strap amplifier is connected to the low side of the averaging detector through the IF filter consisting of resistor R403 and capacitor C404. Two gain control outputs are taken from the cathode output circuit of V401B. One output is a delayed gain control voltage for tube V201. This is taken from the cathode of V401B through gate diode CR403 and a minimum bias circuit which supplies minus 2.2 volts through resistor R408. The value of delay resistor R405 is such that gate diode CR403 will conduct only after the incoming signal has reached a level higher than that required for a 20 db carrier to thermal noise ratio.

The second output is taken from the more negative side of delay resistor R405 and supplies the main gain control bus through gate diode CR402. Gate diode CR402 prevents the main gain control bus from going positive and therefore prevents desensitizing the amplifier tubes.

(2) MANUAL GAIN CONTROL CIRCUITRY. - With AGC-MAN switch S604 in the MAN position, the control grid of the bootstrap amplifier is switched to the arm of variable resistor R603. V401B now becomes a cathode follower with the bias delay for the first RF amplifier remaining in effect.

i. CRT CIRCUITRY. (See figure 4-27.) - The dc voltages on grids 2 and 4 of crt V601 are established by the associated circuitry to give adequate intensity and to focus the signal. Adjustments are not required. The ac power supply supplies 60 cps for the horizontal sweep of the crt. Both the horizontal sweep volt-

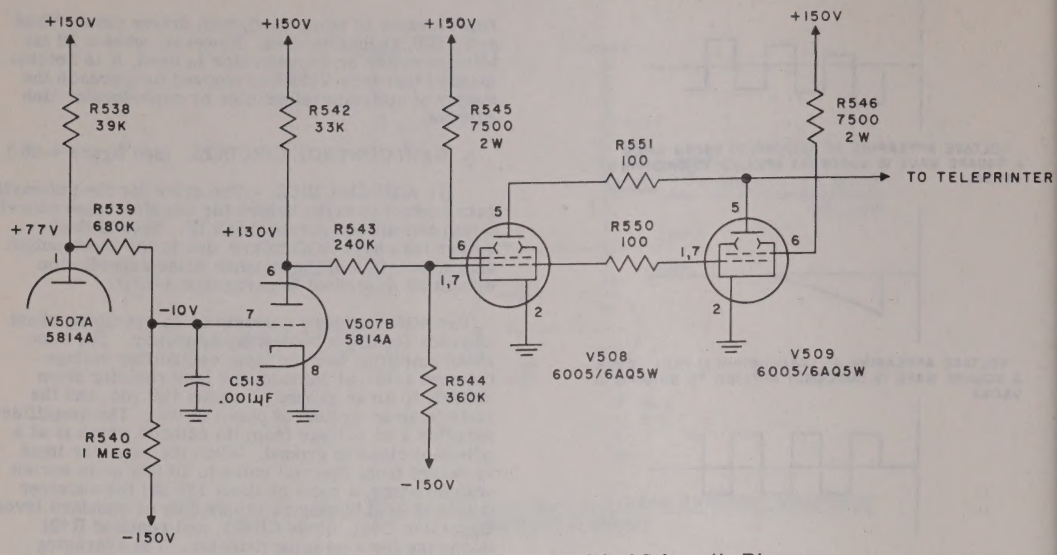


Figure 4-25. Teletype Driver, Simplified Schematic Diagram

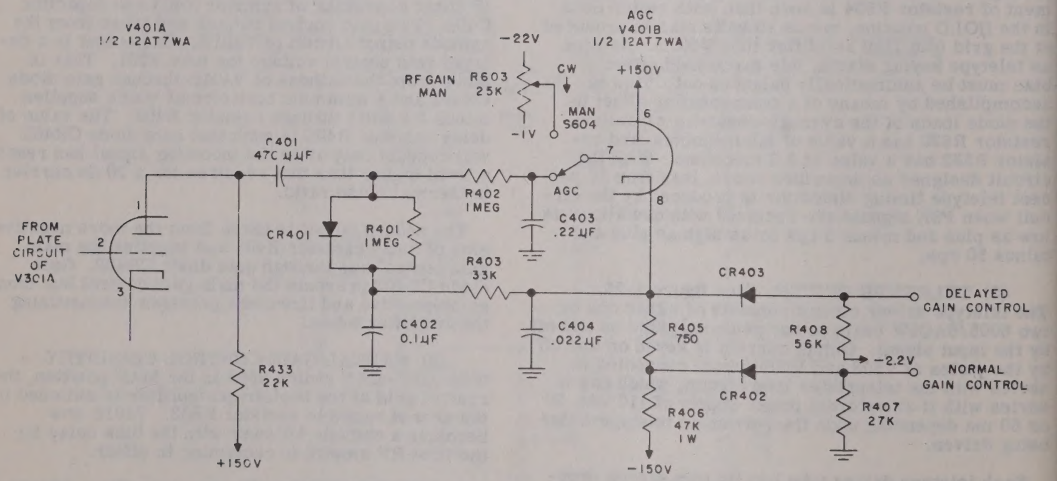


Figure 4-26. Gain Control Circuits, Simplified Schematic Diagram

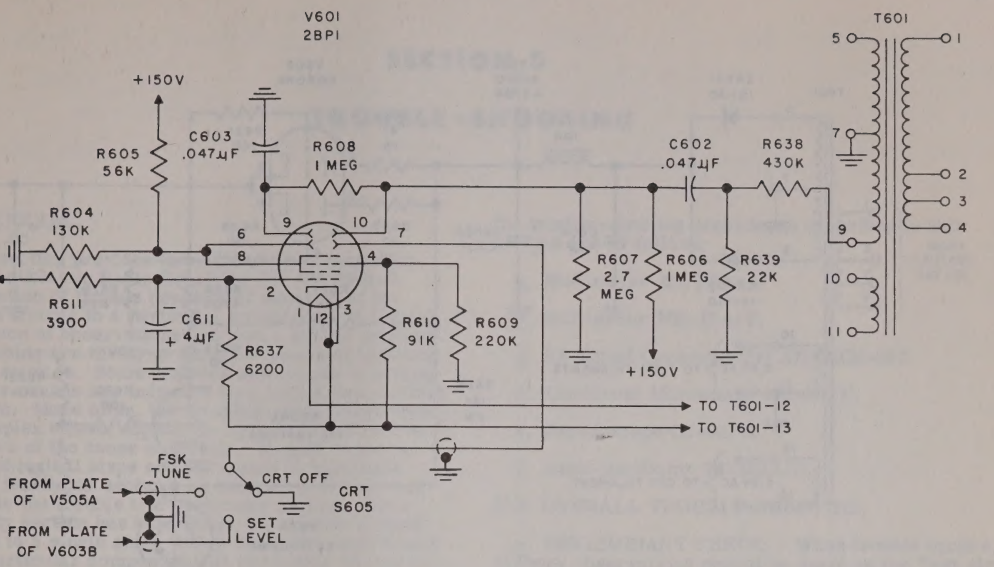


Figure 4-27. CRT Circuit, Simplified Schematic Diagram

ge and the proper dc voltage are fed to one horizon-l plate of the crt. Resistor R608 and capacitor 603 are used as a filter so that only the dc voltage eaches the other horizontal plate, thus proper hori-ontal centering is permanently maintained.

(1) CRT OFF FUNCTION. - When CRT switch 605 is set to CRT OFF position, the beam of the crt deflected off the screen by grounding a vertical eflection plate. Thus, the life of the crt is prolonged.

(2) SET LEVEL FUNCTION. - When CRT switch 605 is set to SET LEVEL position, the crt indi-ator gives a visual display of the level of the signal eing tuned in. The signal level shown is that at the put to the noise cancellation circuit. In this posi-on the signal from amplifier V401A is further mplified by crt deflection amplifier V603B. (See gure 6-40.)

(3) FSK TUNE FUNCTION. - When CRT switch 605 is set to FSK TUNE position, the signal is taken om the plate of dc amplifier V505A located in the letype keyer circuit after the low pass filter and scriminator. The vertical position of the horizon-l line represents the frequency of the received sig-l. When the horizontal line is in the center of the be, the signal is centered in the receiver circuits. wo horizontal lines will occur representing mark nd space signals when receiving FSK. The distance etween these two lines is proportional to the mark nd space frequency separation. A 1/2-inch separa-on of the two lines represents approximately 25 cps equency difference.

Variable resistor R521 is used to compensate for be difference and tube aging; therefore, standard 814A vacuum tubes can be used in the dc coupled chain formed by V504 and V505. Tube V503 is temporarily removed from its socket for proper adjustment of resistor R521. This resistor is adjusted to center the vertical position of the crt trace. Tube V503 is then replaced.

j. POWER SUPPLY CIRCUITS. (See figure 6-41.) - All voltages necessary for operation of the receiver are derived from an ac power supply. Taps on the primary of power transformer T601 accommodate the receiver for 105 to 125 vac at a frequency of 50 to 60 cycles. POWER switch S607 breaks both sides of the input line. Fuses F601 and F602 mounted on the chassis frame protect each side of the line. The power supply contains a positive and negative full wave section, each using silicon rectifiers.

The positive power supply (see figure 4-28) is filtered by C604, L601, and C605A. The voltage at C605 which is plus 270 volts is used in the audio circuits. Series regulator V602, controlled by amplifier V603A, regulates the final output voltage at plus 150 volts. In this regulator circuit the output voltage is divided by R631 and R632 and fed to amplifier V603A whose cathode potential is maintained by regulator tube V604. The output of this amplifier is fed to the control grid of series regulator V602. The loop gain is 10. Capacitor C605B provides additional decoupling for the supplied circuits. Transformer T601 provides filament voltages for all tubes of the receiver.

The negative power supply (see figure 4-29) is filtered by C607, R620, C608, and R621. Voltage regulator tube V605 regulates the negative voltage at minus 150 volts. Capacitor C609 provides additional decoupling for the supplied circuits. The voltage at C607 is minus 340 volts, and it is used to supply the crt cathode voltage.

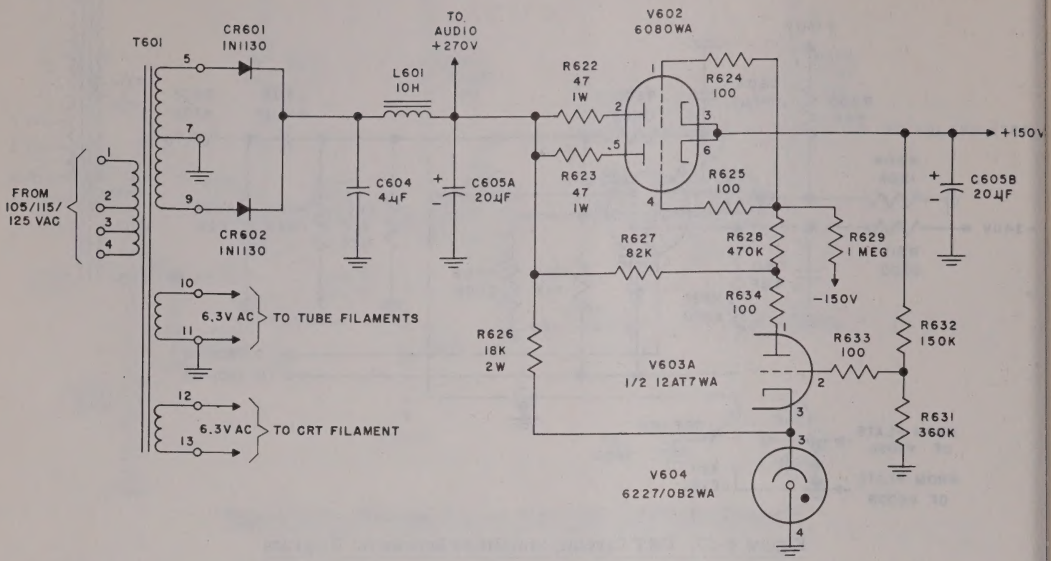


Figure 4-28. AC and +150 Volt Regulated Power Supply, Simplified Schematic Diagram

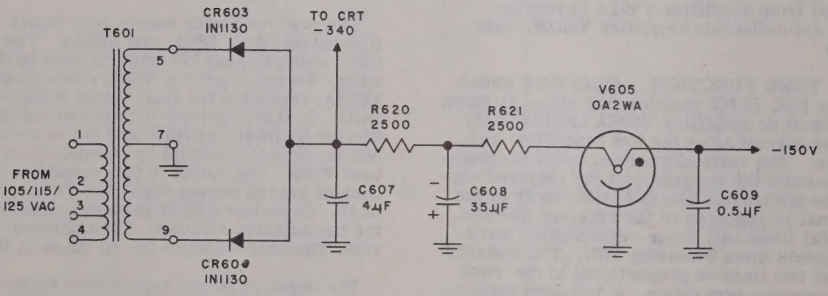


Figure 4-29. -150 Volt Power Supply, Simplified Schematic Diagram

SECTION 5

TROUBLE-SHOOTING

5-1. GENERAL.

This section provides the information required to locate troubles in Radio Receiving Set AN/BRR-3. Localization of trouble consists of isolation of the cause of trouble to a particular component. A logical succession of observations and then a logical process of reasoning are the most effective means of isolating trouble sources. Some troubles are simple in nature, and their causes are indicated by a single well-defined symptom. More often, the troubles cause interacting and complex effects so that the symptoms will not be indicative of the cause of trouble. In such cases, a series of logical steps are necessary to eliminate various functional sections as sources of trouble and to isolate the trouble to a particular section. Once the faulty section has been found, the trouble is then isolated to a single stage within the section and finally to the particular component that is causing the trouble.

In tracing trouble, the technician should make use of the operating data accumulated in the course of operating the receiver, and of the various aids that are incorporated in this manual. Some of the aids included in this manual are as follows:

a. Operating checks (see table 3-3).

b. Receiver block diagrams (see figures 4-1 and 4-2).

c. Schematic and wiring diagrams (see figures 6-32 through 6-50).

d. Trouble-shooting charts (see tables 5-1 through 5-11).

e. Typical trouble chart (see table 5-12).

f. Voltage and resistance charts.

g. Illustrations that show the location of components and test points.

Major test points are identified by a number enclosed in a star; for example: ①, ②. Major test points are used for localizing trouble to a particular functional section. Test points used for isolating a trouble within a specific functional section are identified by an encircled capital letter; for example: Ⓐ, Ⓑ. Test points used for isolating a trouble within a specific circuit are identified by an encircled capital letter and a subscript number; for example: $Ⓐ_1$, $Ⓐ_2$.

5-2. TEST EQUIPMENT AND SPECIAL TOOLS.

Special tools are not required for trouble-shooting this receiver. The test equipment required to perform the trouble-shooting procedures described in this section are as follows:

a. Multimeter AN/PSM-4.

b. Multimeter ME-25A/U.

c. RF Signal Generator Set AN/URM-25D.

d. Electronic Multimeter ME-6B/U.

e. Oscilloscope OS-8A/U.

f. Audio Oscillator TS-382A/U.

5-3. OVERALL TROUBLE-SHOOTING.

a. PRELIMINARY CHECK. - When trouble occurs, sensory observations should be made as the first step in localizing the cause of trouble. An overheated component can often be detected by the burning odor eminating from the component. A visual inspection of crt indicator presentation, dial lamps, control settings, and fuses should be made. Loose cables, charred insulation, burned resistors, broken wires, loose tubes, and physical damage, if noticed, may save time in trouble-shooting the receiver. The blower motor should be checked for smooth, quiet operation. Headphones should be used as an aural indicator of receiver trouble.

Before using the system trouble-shooting chart (see table 5-1) contained in this section, the operator's emergency trouble-shooting procedure contained in table 3-4 should be performed to ensure that easily replaceable components such as faulty fuses, tubes, or dial lamps are eliminated as the trouble source. Figure 6-16 locates and identifies the electron tubes used in the receiver, and figure 6-7 shows the location of the fuses and the dial lamps.

When a preliminary check leads to a burned out component, this component should be considered as the effect, not the cause of the trouble. A further search for the cause of the trouble must still be made; a resistance check of the circuitry associated with the burned out component will isolate the cause of trouble.

b. TEST EQUIPMENT. - The test equipment required to perform the trouble-shooting procedures contained in table 5-1 are as follows:

(1) Multimeter AN/PSM-4.

(2) Multimeter ME-25A/U.

(3) RF Signal Generator Set AN/URM-25D.

c. CONTROL SETTINGS. - Before starting trouble-shooting checks, set the controls and switches located on the front panel of the receiver as follows:

Controls and Switches	Position	Controls and Switches	Position
POWER switch (S606)	OFF	LOCK control	Unlock
NOISE CANCEL switch (S601)	NARROW	BAND WIDTH CPS switch (S301)	60
AUDIO switch (S602)	2500	CRT switch (S605)	SET LEVEL
AUDIO-LEVEL control (R602)	5		
FSK SENSE switch (S603)	HOLD		
RF GAIN MAN control (R603)	7.5		
AGC-MAN switch (S604)	MAN		
ANTENNA SELECTOR switch (S101)	50 OHM		

d. SYSTEM TROUBLE-SHOOTING CHART. - The procedures outlined in table 5-1 should be followed to localize the functional section at fault. See figures 4-1 and 4-2 for block diagrams of the system; see figures 6-32 through 6-41 for the receiver schematic diagrams; and see figures 5-1 and 5-2 for the location of test points.

TABLE 5-1. RADIO RECEIVING SET AN/BRR-3 SYSTEM TROUBLE-SHOOTING CHART

STEP	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	Set POWER switch S606 to ON.	FREQ. dial lamps DS601 and DS602 and tubes filaments should be lit; blower motor B601 should be operating.	If an indication is abnormal, trouble is in power supply circuits. (See table 5-11 and figure 6-41.)
	Wait 30 seconds.	Face of crt indicator V601 should display a horizontal trace that is approximately at the horizontal center.	If horizontal trace is not present proceed to step 2. If crt indicator V601 displays more than 1/8 inch hum deflection, trouble may be poor filtering at power supply circuits. (See table 5-11 and figure 6-41.) If horizontal trace on crt indicator V601 is not at approximate horizontal center, trouble is in CRT circuits. (See table 5-10 and figure 6-40.) If all indications are normal, proceed to step 3.
2	Using Multimeter ME-25A/U, measure dc voltage between terminal 10 on terminal board TB603 (23) and ground. Measure voltage between the following terminals on TB601 and ground: 14 (19) 6 (18) Using Multimeter AN/PSM-4, measure ac voltage between terminals 1 and 26 on TB601 (20).	+145 to +155 vdc -325 to -355 vdc 10 to 12 vac 6.0 to 6.7 vac	If all indications are normal but crt indicator V601 does not display a horizontal trace, trouble is in CRT circuits. (See table 5-10 and figure 6-40.) If an indication is abnormal, trouble is in power supply circuits. (See table 5-11 and figure 6-41.)

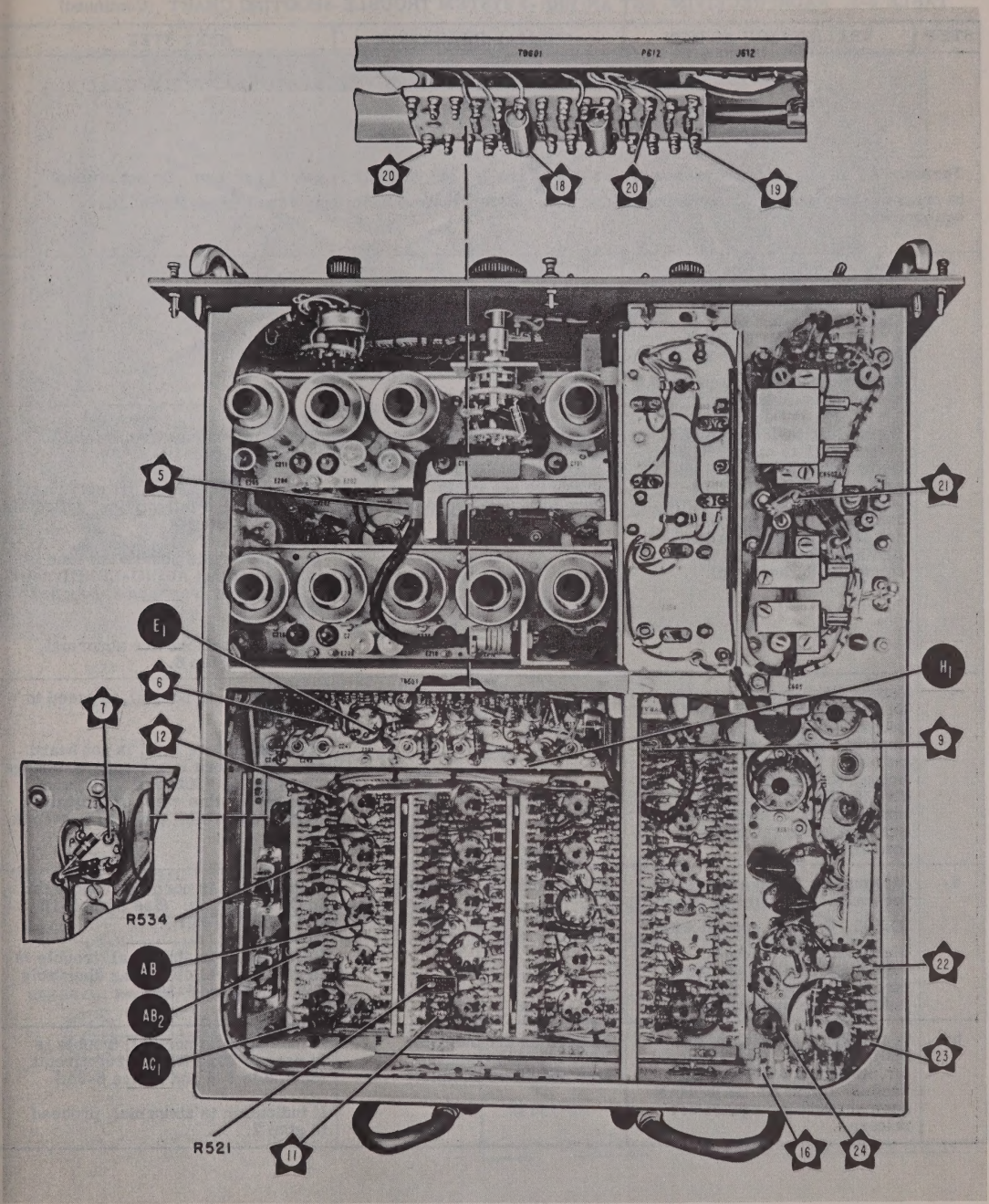


Figure 5-1. Receiver Chassis, Bottom View, Test Point Locations

TABLE 5-1. RADIO RECEIVING SET AN/BRR-3 SYSTEM TROUBLE-SHOOTING CHART (Continued)

STEP	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
	WARNING Terminals 1 and 26 on terminal board TB601 (20) are at -340 vdc with respect to ground. Do not attempt to measure this heater voltage using ground as a reference since harm may result to personnel and equipment.		
3	Plug headphones into AUDIO jack J616 (10). Connect RF Signal Generator Set AN/URM-25D to 50 OHM ANTENNA connector J603 1. Adjust signal generator for 5.0 uv output at 16 kc. Verify that NOISE CANCEL switch S601 is at NARROW. Using RF TUNING control, tune in signal; simultaneously adjust RF GAIN MAN control R603 for a square crt pattern. Adjust AUDIO-LEVEL control R602 for a comfortable tone level.	Square pattern should be visible on crt indicator V601. AUDIO-LEVEL control R602 should be set at less than 8 when tone level is comfortably audible.	If both indications are normal, proceed to step 4. If tone is audible but crt pattern is not capable of full vertical deflection, proceed to step 5. If crt pattern is square but tone is inaudible when AUDIO-LEVEL control is set at less then 8, proceed to step 11. If both indications are abnormal, proceed to step 6.
4	Adjust RF Signal Generator Set AN/URM-25D for 0.05 uv output. Adjust RF GAIN MAN control R603 for square crt pattern. Verify that tone is being received by rocking RF TUNING control back and forth about the in tune position and note change in tone level.	Changing tone level should be heard; crt pattern should be square.	If indication is normal, proceed to step 14. If changing tone level is not heard and crt pattern is not square, change tubes V201, V202, and V203, and then repeat this step. If indication is still abnormal, proceed to step 6.
5	Measure ac voltage between terminal 1 on terminal board TB602 (16) and ground with Multimeter ME-25A/U. Adjust RF GAIN MAN control R603 for a 3.0 vac indication on multimeter.	3.0 vac can be obtained	If indication is normal, trouble is in CRT circuits. (See table 5-10 and figure 6-40.) If indication is abnormal, trouble is in gain control circuits. (See table 5-9 and figure 6-39.)
6	Set NOISE CANCEL switch S601 to WIDE. Tune in signal for maximum tone; simultaneously adjust RF GAIN MAN control R603 for square crt pattern.	Pattern on crt indicator V601 should be square; tone should be audible.	If indication is normal, trouble is in narrow band filter Z201 circuit. (See table 5-4 and figure 6-34.) If indication is abnormal, proceed to step 7.

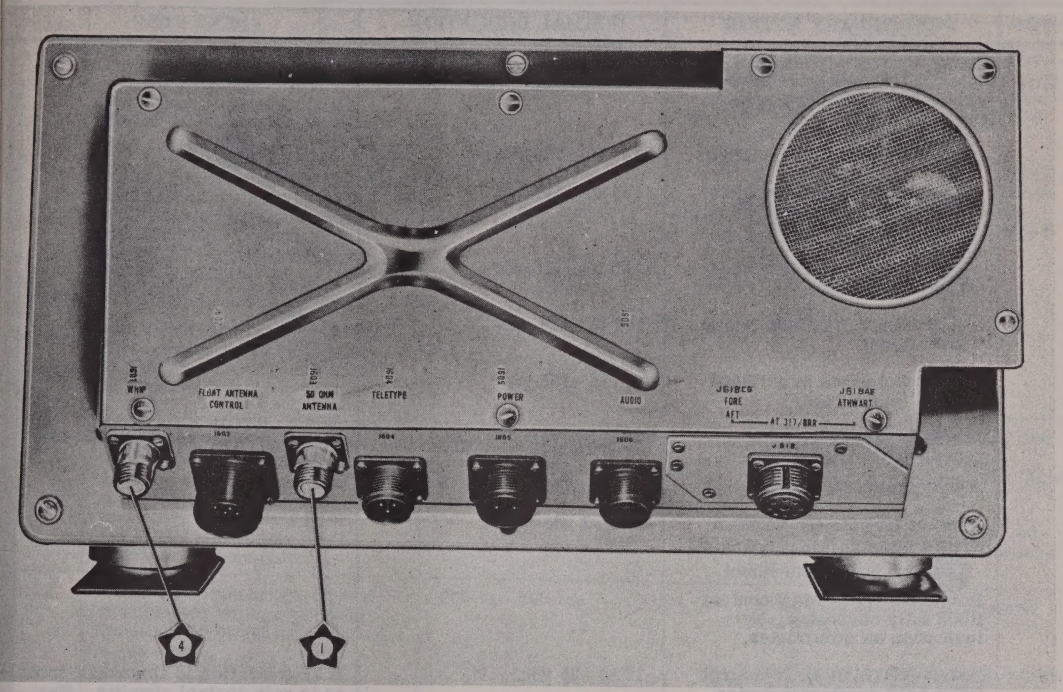


Figure 5-2. Junction Box, Test Point Locations

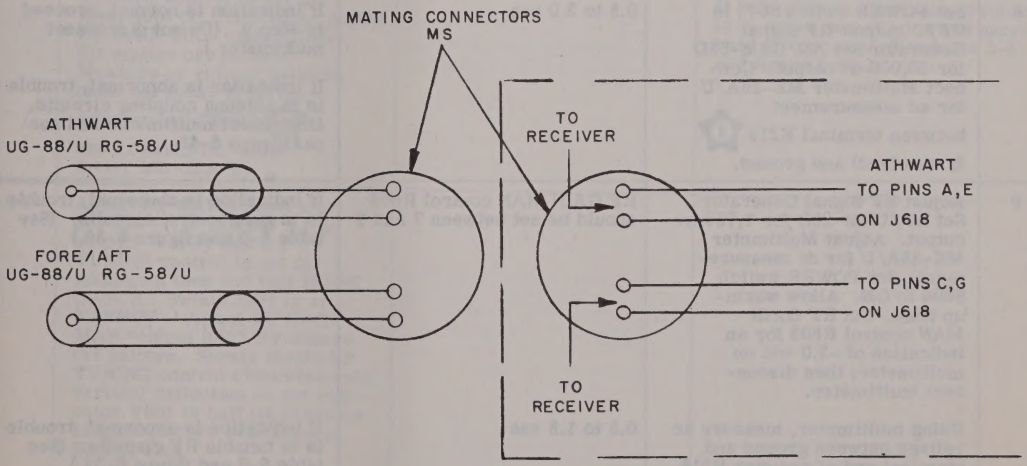


Figure 5-2A. Auxiliary Patch Panel Cable

TABLE 5-1. RADIO RECEIVING SET AN/BRR-3 SYSTEM TROUBLE-SHOOTING CHART (Continued)

STEP	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
7	Using Multimeter ME-25A/U, measure dc voltages between ground and the following test points:		
	(23) Terminal 10 on TB603.	+145 to +155 vdc	
	(H_1) Standoff side of R244. (R244 is connected to pin 6 of XV208.)	+145 to +155 vdc	
	(AC_1) Outer pin 1 of TB504 (red lead).	+145 to +155 vdc	
	(24) Pin 7 of XV605 (violet lead).	-145 to -155 vdc	
	(AB_2) Outer pin 6 of TB504 (violet lead).	-145 to -155 vdc	
	Measure ac voltage between ground and terminal 10 of transformer T601 (21).	6.0 to 6.7 vac	If an indication is abnormal, see table 5-11 and figure 6-41.
	Connect multimeter between ground and pin K of filter Z202 (E_1) for dc measurement. Rotate RF GAIN MAN control R603 fully clockwise. Note indication on multimeter.	-1 to -2 vdc	
	Rotate RF GAIN MAN control R603 fully counterclockwise. Note indication; then disconnect multimeter.	-17 to -25 vdc	If an indication is abnormal, trouble is in gain control circuits. (See table 5-9 and figure 6-39.) If all indications are normal, proceed to step 8.
8	Set POWER switch S606 to OFF. Adjust RF Signal Generator Set AN/URM-25D for 50,000 uv output. Connect Multimeter ME-25A/U for ac measurement between terminal E215 (5) (green lead) and ground.	0.5 to 3.0 vac	If indication is normal, proceed to step 9. (Do not disconnect multimeter.) If indication is abnormal, trouble is in antenna coupling circuits. Disconnect multimeter and see paragraph 5-4f.
9	Adjust RF Signal Generator Set AN/URM-25D for 1,750 uv output. Adjust Multimeter ME-25A/U for dc measurement. Set POWER switch S606 to ON. Allow warm-up time. Set RF GAIN MAN control R603 for an indication of -3.0 vdc on multimeter; then disconnect multimeter.	RF GAIN MAN control R603 should be set between 7 and 9	If indication is abnormal, trouble is in gain control circuits. (See table 5-9 and figure 6-39.)
	Using multimeter, measure ac voltage between ground and terminal end of resistor R216 (6). (R216 is suppressor for pin 7 of XV204.)	0.5 to 1.5 vac	If indication is abnormal, trouble is in tunable RF circuits. (See table 5-3 and figure 6-33.) If both indications are normal, proceed to step 10.

TABLE 5-1. RADIO RECEIVING SET AN/BRR-3 SYSTEM TROUBLE-SHOOTING CHART (Continued)

STEP	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
10	Adjust RF Signal Generator Set An/URM-25D for 0.5 uv output. Connect Multimeter ME-25A/U to pin K of filter Z202 (E1) for dc measurement. Set RF GAIN MAN control R603 for -3.0 vdc on multimeter; then disconnect multimeter. Connect multimeter for ac measurement between ground and terminal G on filter Z306 (7). Rock RF TUNING control back and forth about the 16 kc position, and set for highest indication on multimeter.	0.5 to 4 vac	If indication is normal, trouble is in noise cancellation and narrow band IF circuits. (See table 5-5 and figure 6-35.) If indication is abnormal, trouble is in mixer and variable bandwidth IF circuits. (See table 5-4 and figures 6-34 and 6-35.)
11	Set BAND WIDTH CPS switch S301 from 60 to 120 and then to 170; adjust RF TUNING control for maximum tone or maximum crt deflection; and simultaneously adjust RF GAIN MAN control R603 for square pattern.	Tone should be comfortably audible in headphones when AUDIO-LEVEL control R602 is set at less than 8	If indication is normal at any one switch position, trouble is in narrow band IF circuit. (See table 5-5 and figure 6-35.) If tone is not obtained at any setting of BAND WIDTH CPS switch, proceed to step 12.
12	Using Multimeter ME-25A/U, measure dc voltage between terminal 15 on terminal board TB603 (22) and ground.	+260 to +290 vdc	If indication is normal, proceed to step 13. If indication is abnormal, see table 5-11 and figure 6-41.
13	Set BAND WIDTH CPS switch S301 to 60. Adjust RF Signal Generator Set AN/URM-25D for 5.0 uv output. Verify that RF TUNING control is set for maximum crt deflection. Adjust RF GAIN MAN control R603 for square crt pattern. Measure ac voltage between outer terminal 21 on terminal board TB302 (9) and ground with Multimeter ME-25A/U.	1.5 to 2.5 vac	If indication is normal, trouble is in audio circuits. (See table 5-6 and figure 6-36.) If indication is abnormal, trouble is in noise cancellation and narrow band IF circuits. (See table 5-5 and figure 6-35.)
14	Adjust RF Signal Generator Set AN/URM-25D for 5.0 uv output. Verify that RF TUNING control is set for maximum tone and that NOISE CANCEL switch S601 is at NARROW. Adjust RF GAIN MAN control R603 for square crt pattern. Slowly rotate RF TUNING control clockwise until vertical deflection on crt indicator V601 is half its previous height. Record indication of FREQ. dial. Slowly rotate RF TUNING control counterclockwise, noting that vertical deflection on crt	 Difference between the two indications should be 0.15 to 0.20 kc	 If indication is abnormal, trouble is in narrow band filter Z201 circuit. (See table 5-4 and figure 6-36.)

TABLE 5-1. RADIO RECEIVING SET AN/BRR-3 SYSTEM TROUBLE-SHOOTING CHART (Continued)

STEP	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
14 (cont.)	indicator V601 increases to maximum and then recedes. Continue rotation of RF TUNING control until vertical deflection is again half its maximum height. Record indication of FREQ. dial. Subtract this indication from the previously recorded indication.		
	Readjust RF TUNING control for maximum tone. Set NOISE CANCEL switch S601 to WIDE.	Vertical deflection on crt indicator V601 should show less than 1/8-inch change in amplitude	If indication is abnormal and the change is a decrease in deflection, trouble is in wide band filter Z202 circuit. If the change is an increase in deflection, trouble is in narrow band filter Z201 circuit. (See table 5-4 and figure 6-34.)
	Slowly rotate RF TUNING control clockwise until vertical deflection on crt indicator V601 is half its previous height. Record indication of FREQ. dial.		
	Slowly rotate RF TUNING control counterclockwise noting that vertical deflection on crt indicator V601 increases to maximum and then recedes. Continue rotation of RF TUNING control until vertical deflection on crt indicator V601 is again half its maximum height. Record indication of FREQ. dial. Subtract this indication from the previously recorded indication.	Difference between the two indications should be 0.80 to 1.10 kc	If indication is abnormal, proceed to step 15. If all indications are normal, proceed to step 16.
15	Adjust RF Signal Generator Set AN/URM-25D for 5,000 uv output. Readjust RF TUNING control for maximum; simultaneously adjust RF GAIN MAN control R603 for square crt pattern. Connect Multimeter ME-25A/U for ac measurement between ground and terminal end of resistor R216 (6). (R216 is suppressor for pin 7 of XV204.) Set RF GAIN MAN control R603 for 1.0 vac on multimeter. Slowly rotate RF TUNING control clockwise until indication on multimeter is 0.5 vac. Record indication of FREQ. dial.	Pattern on crt indicator V601 should be square	If adjustment of RF GAIN MAN control R603 cannot produce a square crt pattern, trouble is in gain control circuit or circuit interconnecting wiring. (See table 5-9 and figure 6-39.)

TABLE 5-1. RADIO RECEIVING SET AN/BRR-3 SYSTEM TROUBLE-SHOOTING CHART (Continued)

STEP	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
15 (cont.)	Slowly rotate RF TUNING control counterclockwise noting that indication on multimeter increases to 1.0 vac and then recedes. Continue rotation of RF TUNING control until indication on multimeter is again 0.5 vac. Record indication of FREQ. dial. Subtract this indication from previously recorded indication.	Difference between the two indications should be 0.80 to 1.20 kc	If indication is normal, trouble is in mixer and variable bandwidth IF circuits. (See table 5-4 and figure 6-34.) If indication is abnormal, trouble is in tunable RF circuits. (See table 5-3 and figure 6-33.)
16	Set NOISE CANCEL switch S601 to NARROW. Adjust RF TUNING control for maximum vertical deflection on crt indicator V601. Set RF GAIN MAN control R603 to 0.	Vertical deflection on crt indicator V601 should be 0	
	Set AGC-MAN switch S604 to AGC.	After approximately three seconds, the AGC circuit should complete its function to adjust receiver gain and produce an approximately square pattern on crt indicator V601	If an indication is abnormal, trouble is in gain control circuits. (See table 5-9 and figure 6-39.) If both indications are normal, proceed to step 17.
17	Set AGC-MAN switch S604 to MAN. Adjust RF TUNING control for maximum tone; simultaneously adjust RF GAIN MAN control R603 for square pattern on crt indicator V601. Adjust AUDIO-LEVEL control R602 for a comfortable sound level. Slowly increase setting of RF GAIN MAN control R603 to 10.	Volume should increase slightly, decrease to almost a null, and then increase again	If indication is normal, proceed to step 18. If indication is abnormal, trouble is in noise cancellation circuit. (See table 5-5 and figure 6-35.)
18	Set NOISE CANCEL switch S601 to WIDE. Verify that BAND WIDTH CPS switch S301 is at 60. Verify that RF TUNING control is set for maximum tone; simultaneously adjust RF GAIN MAN control R603 for square pattern on crt indicator V601. Set BAND WIDTH CPS switch S301 to 120, to 170, and back to 60.	Volume of tone should be the same in all three positions	
	Note indication on FREQ. dial. Rotate RF TUNING control counterclockwise until FREQ. dial setting is 0.06 kc (3 small divisions) lower than previously noted indication.	Volume of tone should decrease appreciably	
	Set BAND WIDTH CPS switch S301 to 120. Adjust RF TUNING control for maximum tone. Note indication on FREQ. dial. Rotate RF TUNING control counterclockwise until	Volume of tone should decrease appreciably	

TABLE 5-1. RADIO RECEIVING SET AN/BRR-3 SYSTEM TROUBLE-SHOOTING CHART (Continued)

STEP	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
18 (cont.)	FREQ. dial setting is 0.12 kc (6 small divisions) lower than previously noted indication.		
	Set BAND WIDTH CPS switch S301 to 170. Adjust RF TUNING control for maximum tone. Note indication on FREQ. dial. Rotate RF TUNING control counterclockwise until FREQ. dial setting is 0.17 kc (8-1/2 small divisions) lower than previously noted indication.	Volume of tone should decrease appreciably	If all indications are normal, proceed to step 19. If an indication is abnormal, trouble is in narrow band IF circuit. (See table 5-5 and figure 6-35.)
19	Set NOISE CANCEL switch S601 to NARROW. Adjust RF TUNING control for maximum tone; simultaneously adjust RF GAIN MAN control R603 for square pattern. Set AUDIO switch S602 to 1000.	Audio tone should be medium - pitched	
	Set AUDIO switch S602 to 600.	Audio tone should be low-pitched	
	Set AUDIO switch S602 to 2500.	Audio tone should be high-pitched	If all indications are normal, proceed to step 20. If an indication is abnormal, trouble is in audio circuits. (See table 5-6 and figure 6-36.)
20	Adjust RF Signal Generator Set AN/URM-25D for 5,000 uv output. Verify that RF TUNING control is set for maximum tone; simultaneously adjust RF GAIN MAN control R603 for square pattern on crt indicator V601. Set CRT switch S605 to FSK TUNE. Verify that BAND WIDTH CPS switch S301 is at 170. Adjust RF TUNING control for horizontal straight line trace on crt indicator V601 to appear approximately 1/2 inch above vertical center. Readjust signal generator for 50 uv output.	Trace on crt indicator V601 should not move more than 1/8 inch	
	Readjust signal generator for 5.0 uv output.	Trace on crt indicator V601 should be approximately at the vertical center and should show some 'bounce' motion	If both indications are normal, proceed to step 21. If an indication is abnormal, trouble is in FSK detecting circuits. (See table 5-7 and figure 6-37.)
21	Verify that CRT switch S605 is set to FSK TUNE. Remove tube V503 and its shield. Adjust variable resistor R521 to	Adjustment of R521 should be capable of vertically centering trace on crt indicator V601	If indication is normal, adjust variable resistor R521 to center trace on crt indicator V601, and proceed to step 24.

TABLE 5-1. RADIO RECEIVING SET AN/BRR-3 SYSTEM TROUBLE-SHOOTING CHART (Continued)

STEP	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
21 (cont.)	vertically center straight line horizontal trace on crt indicator V601.		If indication is abnormal, proceed to step 22.
22	Connect Multimeter ME-25A/U between inner terminal 1 on terminal board TB502 (11) and ground. Adjust variable resistor R521 to obtain an indication of -5 vdc on multimeter.	Adjustment of R521 should be capable of obtaining a multimeter indication of -5 vdc	If indication is normal, disconnect multimeter and proceed to step 23. If indication is abnormal, trouble is in FSK detecting circuits. Replace tube V503, disconnect multimeter, and see table 5-7 and figure 6-37.
23	Connect Multimeter ME-25A/U between inner terminal 17 on terminal board TB504 (12) and ground. Adjust variable resistor R521 to obtain an indication of +100 vdc on multimeter.	Adjustment of R521 should be capable of obtaining a multimeter indication of +100 vdc	If indication is normal, trouble is in CRT switch S605 circuit. Replace tube V503, disconnect multimeter, and see table 5-10 and figure 6-40. If indication is abnormal, trouble is in V505A circuit. Replace tube V503, disconnect multimeter, and see table 5-8 and figure 6-38.
24	Connect Multimeter ME-25A/U to measure dc voltage between pin 7 of tube socket XV507 (AB) (green lead) and ground. Adjust variable resistor R534 to obtain an indication of -10 vdc on multimeter.	Adjustment to R534 should be capable of obtaining a multimeter indication of -10 vdc	If indication is normal, adjust variable resistor R534 for an indication of -10 vdc on multimeter. (A few 10ths of a volt 'bounce' may be noticed on multimeter. This action is normal.) Replace tube V503 and its shield, disconnect multimeter, and proceed to step 25. If indication is normal but teleprinter does not respond properly to received signal, trouble is in Teletype Patch Panel (GFM) or in teletype keyer circuits. Replace tube V503 and its shield, disconnect multimeter, and check patch panel. (Then see table 5-8 and figure 6-38.) If indication is abnormal, trouble is in teletype keyer circuits. Replace tube V503 and its shield, and disconnect multimeter. (Then see table 5-8 and figure 6-38.)
25	Set CRT switch S605 to SET LEVEL. Set BAND WIDTH CPS switch S301 to 60. Verify that RF TUNING control is set for maximum tone; simultaneously adjust RF GAIN MAN control R603 for square pattern on crt indicator V601. NOTE In almost all installations the antenna connectors of the receiver will be run to an Antenna		

TABLE 5-1. RADIO RECEIVING SET AN/BRR-3 SYSTEM TROUBLE-SHOOTING CHART (Continued)

STEP	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
25 (cont)	Patch Panel, and in order to check the complete antenna circuit wiring the following two antenna circuit tests should be made with the signal generator fed to the Patch Panel connectors. To properly connect the signal generator to the ATHWART and FORE-AFT pins of the Patch Panel Connector (which are in turn connected to Receiver AT-317/BRR Loop Antenna Connector) it will be necessary to construct an auxiliary cable (shown in figure 5-2A) to accomplish the electrical connections. Because different Patch Panels use different Loop Antenna Connectors, the MS type connector at one end of the auxiliary cable shown in figure 5-2A has not been specified; it should be procured after ascertaining the connector type used on the specific Patch Panels involved. Connect RF Signal Generator Set AN/URM-25D to Patch Panel connector which feeds 50 OHM ANTENNA connector J603 (1), or if practical, connect signal generator directly to J603. Adjust signal generator for 5 uv output at 16 KC. Set CRT switch S605 to SET LEVEL. Set BANDWIDTH CPS switch S301 to 60. Verify that RF TUNING control is set for maximum tone; simultaneously adjust RF GAIN MAN control R603 for square pattern on CRT indicator V601. NOTE Do not change setting of RF GAIN MAN control R603 until below instructions so specify.		

TABLE 5-1. RADIO RECEIVING SET AN/BRR-3 SYSTEM TROUBLE-SHOOTING CHART (Continued)

STEP	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
25 (Cont)	Disconnect RF Signal Generator Set AN/URM-25D from Patch Panel connector which feeds 50 OHM ANTENNA connector J603 (1), and connect it to ATHWART coax of the auxiliary Patch Panel cable constructed as shown in figure 5-2A. Set ANTENNA SELECTOR switch S101 to ATHWART.	Vertical deflection on crt indicator V601 should be reduced to approximately half its horizontal deflection	
	Disconnect signal generator from the ATHWART coax of the auxiliary Patch Panel cable, and connect it to the FORE-AFT cable of the auxiliary Patch Panel cable constructed as shown in figure 5-2A. Set ANTENNA SELECTOR switch S101 to FORE-AFT.	Vertical deflection on crt indicator V601 should again be approximately half its horizontal deflection	
	Adjust RF GAIN MAN control R603 for square pattern on CRT indicator V601. NOTE Do not change setting of RF GAIN MAN control R603 for remainder of this step.		
	Disconnect signal generator from the FORE-AFT coax of the auxiliary Patch Panel cable, and connect it to the Patch Panel connector which feeds the WHIP connector J601 (4). Set ANTENNA SELECTOR switch to WHIP 2000 MMF.	Vertical deflection on crt indicator V601 should be reduced to approximately half its horizontal deflection	If all indications are normal, proceed to step 26. If an indication is abnormal, trouble is in Antenna Coupling Circuits (see paragraph 5-4f) or in the Patch Panel Wiring.
26	Adjust RF GAIN MAN control R603 for square pattern on crt indicator V601. Adjust RF Signal Generator Set AN/URM-25D, and tune receiver for maximum tone at the following frequencies: 22 kc 28 kc	At each frequency, pattern should remain approximately square (vertical deflection should not change more than 2:1)	If indications are normal, disconnect signal generator and proceed to step 27. If indication is abnormal, check frequency gain control R227 circuit. (See figure 6-33.)

TABLE 5-1. RADIO RECEIVING SET AN/BRR-3 SYSTEM TROUBLE-SHOOTING CHART (Continued)

STEP	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
	NOTE The following steps may be omitted if Antenna Group AN/BRA-7(XN-1) or AN/BRA-8(XN-1) responds properly to RF TUNING control and NOISE CANCEL switch on receiver.		
27	With receiver connected to Antenna Tuning Control Unit of Antenna Group and the control unit energized, set TUNING SELECTOR switch on control unit to AUTOMATIC. Set RF TUNING control on receiver to 27 kc and then back to 28 kc.		
	Wait for FREQUENCY indicator on control unit to complete its stepping operation and note its setting.	FREQUENCY indicator on control unit should indicate 27.5 to 28.5 kc	If indication is normal, proceed to step 29.
	Adjust control unit for manual operation. Tune receiver and control unit (manually) to a station of an accurately known frequency. Note frequency indications on receiver and control unit.	Indication on FREQ. dial of receiver should be within ± 0.1 kc of station frequency	If indication is abnormal, proceed to step 28.
		Indication on FREQUENCY indicator of control unit should be within ±0.16 kc of station frequency	If indication is abnormal, trouble is in Antenna Group.
	Set TUNING SELECTOR switch on control unit to AUTOMATIC.	Stepping switches in control unit should not operate	If indication is abnormal, trouble is in remote tuning synchro transmitter B201 circuit. (See table 5-3 and figure 6-33.)
28	Rotate RF TUNING control on receiver to counterclockwise stop.	Drive pin end of tuning capacitor shaft clamps, which are mounted on gears that drive C201 and C202, should both be in the up position and almost exactly vertical	
		FREQ. dial on receiver should indicate between 13.8 and 13.9 kc	
	Rotate RF TUNING control on receiver to 22 kc.	Both clamps should be almost exactly in the horizontal position	
	Rotate RF TUNING control on receiver to clockwise stop.	Clamps should be in the down position and almost exactly vertical	
		FREQ. dial on receiver should indicate between 30.3 and 30.5 kc	If an indication is abnormal, trouble is in gear drive mechanism or bead chain dial drive.
29	Set TUNING SELECTOR switch on control unit to right LOCK. Set NOISE CANCEL switch S601 on receiver to WIDE and then to NARROW.	Stepping of bandwidth switch in control unit should be audible	If indication is abnormal, troubleshoot NOISE CANCEL switch S601 circuit on receiver. (See figure 6-34.)

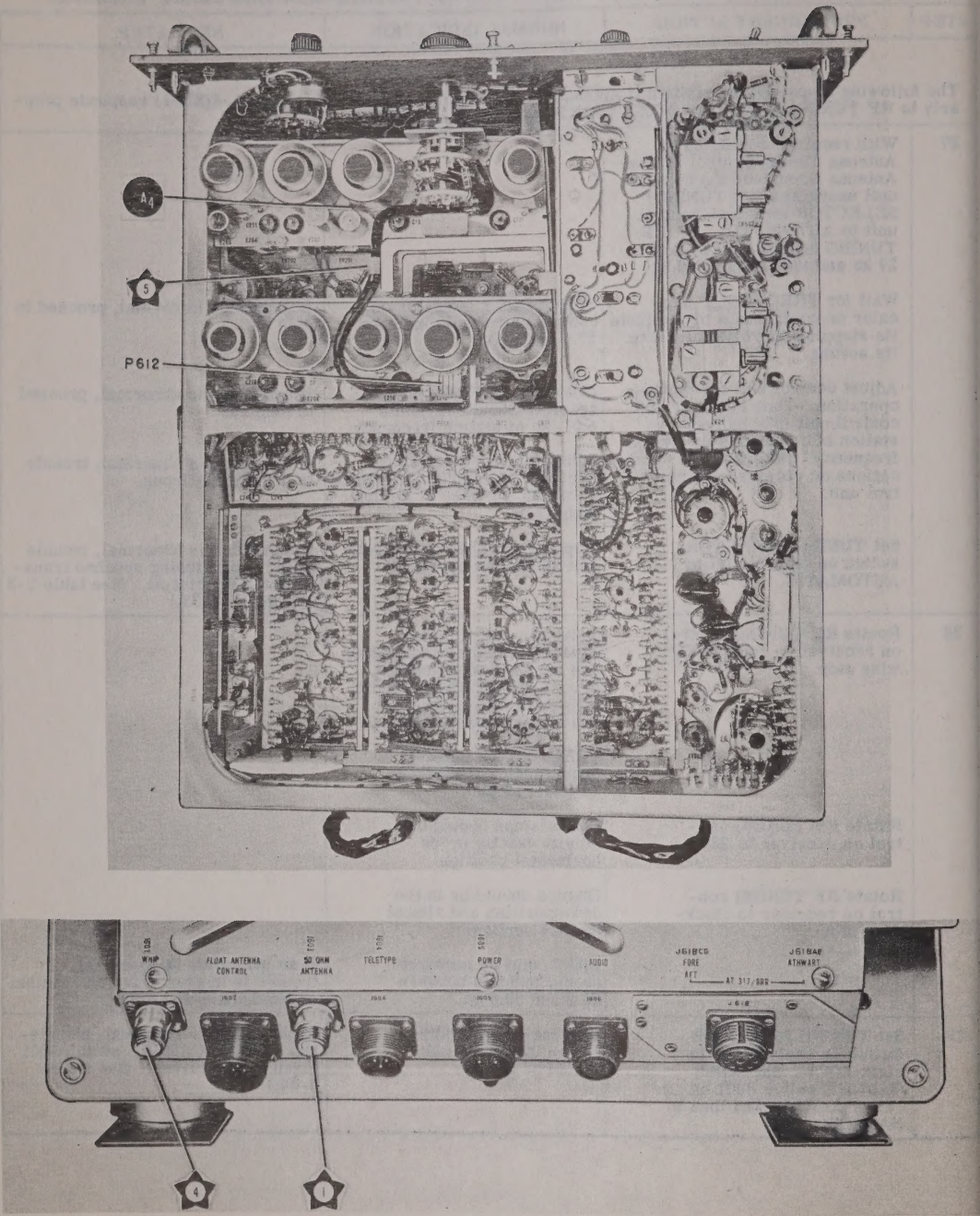


Figure 5-3. Antenna Coupling Circuits, Test Point Locations

5-4. FUNCTIONAL SECTION TROUBLE-SHOOTING.

Radio Receiving Set AN/BRR-3 is divided into 10 functional sections as indicated in figure 4-1. Figures 6-34 through 6-41 are the schematic diagrams for each functional section. In figure 6-35, wide band IF filter Z306 is shown as part of the noise cancellation and narrow band IF circuits. Since this component with its associated circuitry is the plate load for third IF amplifier V208, it will be considered as part of the mixer and variable bandwidth IF circuits to facilitate the trouble-shooting procedure.

In all stage gain measurements, momentarily reduce the signal generator output to zero. This momentary loss of signal ensures recognition that the output indication is the signal voltage and not the noise level.

a. PRELIMINARY CHECK. - A failure in the receiver can usually be isolated to the faulty functional section by logical interpretation of the indications displayed on the receiver's crt indicator, strength of the signal at the headphones, or operation of the teleprinter. Refer to the overall trouble-shooting chart (see table 5-1) as an aid to localize the trouble.

b. TEST EQUIPMENT. - The test equipment required to perform the trouble-shooting procedures contained in tables 5-2 through 5-11 are listed in paragraph 5-2.

c. CONTROL SETTINGS. - Before starting each of the particular functional section trouble-shooting checks, set the controls located on the front panel of the receiver as follows:

Controls and Switches	Position
POWER switch (S606)	ON
NOISE CANCEL switch (S601)	NARROW
AUDIO switch (S602)	2500
AUDIO-LEVEL control (R602)	5
FSK SENSE switch (S603)	HOLD
RF GAIN MAN control (R603)	7.5
AGC-MAN switch (S604)	MAN
ANTENNA SELECTOR switch (S101)	50 OHM
LOCK control	Unlock
BAND WIDTH CPS switch (S301)	60
CRT switch (S605)	SET LEVEL
RF TUNING control	14 KC

d. FUNCTIONAL SECTION TROUBLE-SHOOTING CHARTS. - The functional section trouble-shooting charts are contained in tables 5-2 through 5-11 and are provided as an aid to localize equipment malfunction. These charts should be used in conjunction with the circuit voltage and resistance charts, the test point location illustrations, and the schematic diagrams that are referenced with each of the trouble-shooting charts.

e. VOLTAGE AND RESISTANCE MEASUREMENTS. - After the trouble has been localized to a particular section or stage of the receiver, further checks must be made to determine the exact component or components that have failed. After a thorough physical inspection has been made for broken leads, etc., resistance and/or voltage measurements should be made and compared with the typical readings. Proper analysis of any differences should lead the technician to the faulty components.

CAUTION

Check that POWER switch S606 is set to OFF before performing any resistance checks to prevent damaging of the test equipment.

f. ANTENNA COUPLING CIRCUITS TROUBLE-SHOOTING PROCEDURE. - A trouble in the antenna coupling circuits is isolated by resistance checking the circuits. To perform this check, set POWER switch S606 to OFF, disconnect plug P612 from receptacle J612, and perform the resistance checks contained in table 5-2. Figures 5-3, 6-32, and 6-42 should be referred to when using this table. Terminal locations and resistances for inductor L101 and transformer T101 are shown in figure 5-4. Instructions for removal and replacement of the RF head are contained in Section 6, paragraph 6-5a.

If the trouble is not found during the resistance check, perform a continuity check on the circuit between J612 and the antenna connectors 1 through 4 on the rear of the receiver (see figure 5-2).

TABLE 5-2. ANTENNA COUPLING CIRCUITS, RESISTANCE CHECKS

ANTENNA SELECTOR SWITCH POSITION	CHECK BETWEEN POINTS	NORMAL INDICATION (OHMS)
50 OHM	P612-E and P612-F	1.5 to 1.9
	P612-A and P612-B	∞
	P612-C and P612-D	∞
	P612-K and ground	0
	P612-H and ground	∞

TABLE 5-2. ANTENNA COUPLING CIRCUITS, RESISTANCE CHECKS (Continued)

ANTENNA SELECTOR SWITCH POSITION	CHECK BETWEEN POINTS	NORMAL INDICATION (OHMS)
WHIP 2000 MMF	P612-E and P612-F	0
	P612-A and P612-B	∞
	P612-C and P612-D	∞
	P612-H and ground	∞
OMNI	P612-E and P612-F	0
	P612-A and P612-B	0.7 to 1.1
	P612-C and P612-D	0.7 to 1.1
	P612-H and ground	∞
FORE AFT	P612-E and P612-F	0
	P612-A and P612-B	∞
	P612-C and P612-D	0.7 to 1.1
	P612-H and ground	∞
ATHWART	P612-E and P612-F	0
	P612-A and P612-B	0.7 to 1.1
	P612-C and P612-D	∞
	P612-H and ground	∞
	E215 (5) and E201 (A4)	70k to 80k

g. TUNABLE RF CIRCUITS TROUBLE-SHOOTING CHART. - The procedure used to locate a trouble in the tunable RF circuits is contained in table 5-3. Figures 5-5, 5-6, and 6-33 should be referred to when using this table. In all stage gain measurements, momentarily reduce the signal generator output to zero. This momentary loss of signal ensures recognition that the output indication is the signal voltage and not the noise level.

TABLE 5-3. RADIO RECEIVING SET AN/BRR-3, TUNABLE RF CIRCUITS TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
		NOTE If tuning of Antenna Group AN/BRA-7(XN-1) or AN/BRA-8(XN-1) does not respond properly to adjustment of RF TUNING control on receiver, proceed to step 4.		
1	(See figure 5-5.) (6)	Connect test lead CX-1363/U (containing a 0.1 uf blocking capacitor) to RF Signal Generator Set AN/URM-25D. Adjust signal generator for 1,000 uv output at 14 kc. Connect red signal generator test lead to terminal end of resistor R216 (suppressor for pin 7 of V204) and connect black test lead to ground. Con-		

COMPONENT	TERMINAL	RESISTANCE IN OHMS	
		COMPONENT IN CIRCUIT *	COMPONENT OUT OF CIRCUIT
T101	A TO B	0.9	0.9
	H TO L	460	460
	H TO B	∞	∞
	B TO GRD	∞	∞
	H TO GRD	∞	∞
T102	H TO L	500	500
	R TO F	1.7	1.7
	A TO B	1	1
	H TO A	∞	∞
	H TO R	∞	∞
	A TO R	∞	∞
	F TO GRD	0	∞
L101	PIN TO PIN	0.4	0.4

* NOTE:
SET POWER SWITCH TO OFF, SET ANTENNA SELECTOR TO OMNI, DISCONNECT P612 FROM J612.

g Circuits, Voltage and Resistance Chart

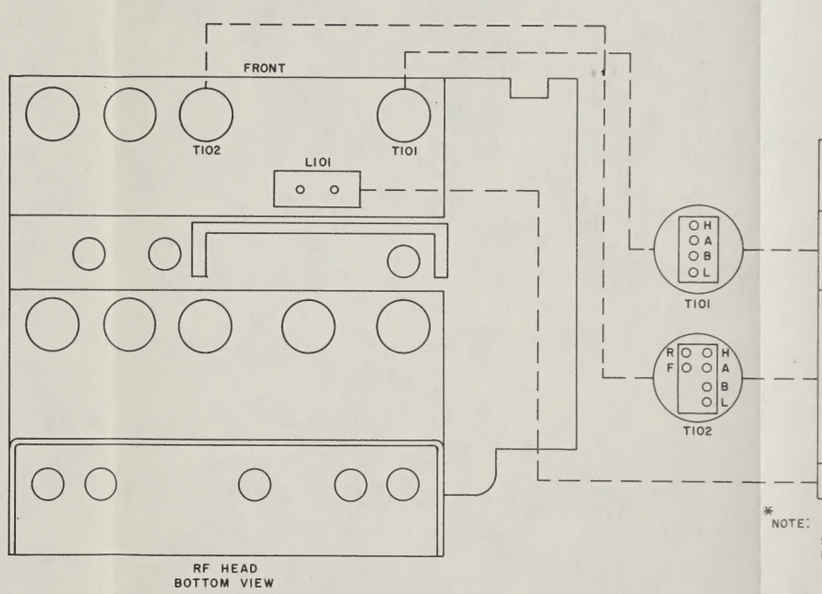
TABLE 5-2. ANTENNA COUPLING CIRCUITS, RESISTANCE CHECKS (Continued)

ANTENNA SELECTOR SWITCH POSITION	CHECK BETWEEN POINTS	NORMAL INDICATION (OHMS)
WHIP 2000 MMF	P612-E and P612-F	0
	P612-A and P612-B	∞
	P612-C and P612-D	∞
	P612-H and ground	∞
OMNI	P612-E and P612-F	0
	P612-A and P612-B	0.7 to 1.1
	P612-C and P612-D	0.7 to 1.1
	P612-H and ground	∞
FORE AFT	P612-E and P612-F	0
	P612-A and P612-B	∞
	P612-C and P612-D	0.7 to 1.1
	P612-H and ground	∞
ATHWART	P612-E and P612-F	0
	P612-A and P612-B	0.7 to 1.1
	P612-C and P612-D	∞
	P612-H and ground	∞
	E215 (5) and E201 (A4)	70k to 80k

g. TUNABLE RF CIRCUITS TROUBLE-SHOOTING CHART. - The procedure used to locate a trouble in the tunable RF circuits is contained in table 5-3. Figures 5-5, 5-6, and 6-33 should be referred to when using this table. In all stage gain measurements, momentarily reduce the signal generator output to zero. This momentary loss of signal ensures recognition that the output indication is the signal voltage and not the noise level.

TABLE 5-3. RADIO RECEIVING SET AN/BRR-3, TUNABLE RF CIRCUITS TROUBLE-SHOOTING CHART

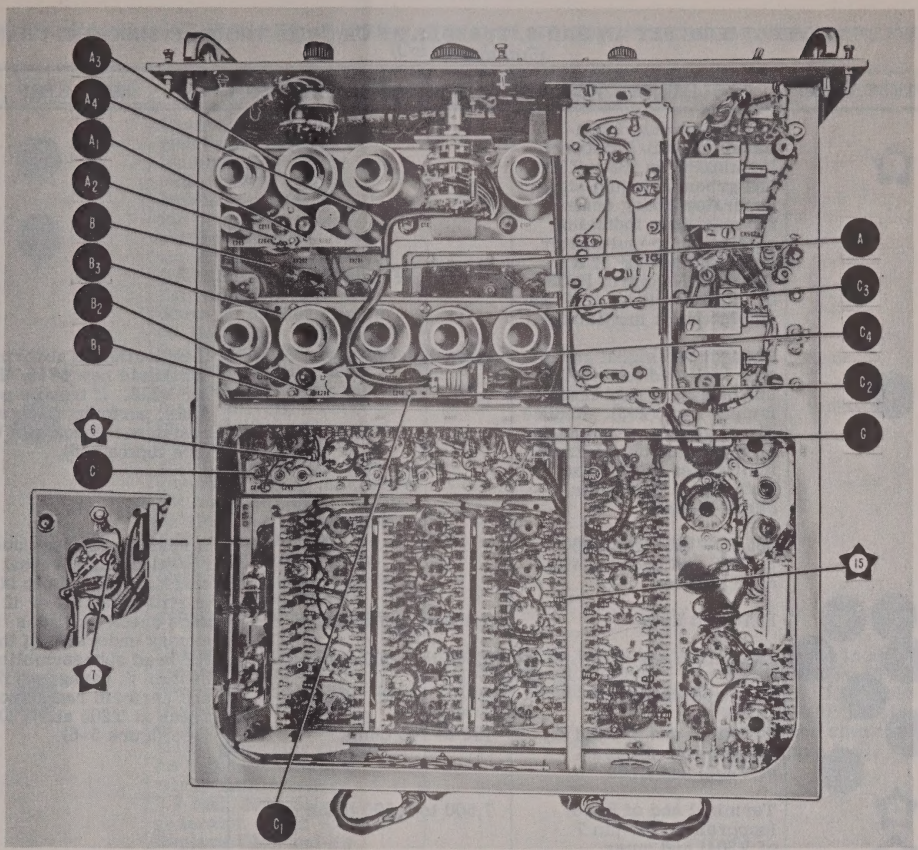
STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
NOTE If tuning of Antenna Group AN/BRA-7(XN-1) or AN/BRA-8(XN-1) does not respond properly to adjustment of RF TUNING control on receiver, proceed to step 4.				
1	(See figure 5-5.) (6)	Connect test lead CX-1363/U (containing a 0.1 uf blocking capacitor) to RF Signal Generator Set AN/URM-25D. Adjust signal generator for 1,000 uv output at 14 kc. Connect red signal generator test lead to terminal end of resistor R216 (suppressor for pin 7 of V204) and connect black test lead to ground. Con-		

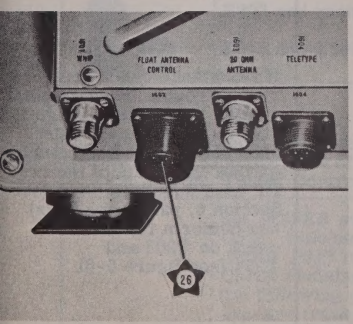


COMPONENT	TERMINAL	RESISTANCE IN OHMS	
		COMPONENT IN CIRCUIT *	COMPONENT OUT OF CIRCUIT
T101	A TO B	0.9	0.9
	H TO L	460	460
	H TO B	∞	∞
	B TO GRD	∞	∞
	H TO GRD	∞	∞
T102	H TO L	500	500
	R TO F	1.7	1.7
	A TO B	1	1
	H TO A	∞	∞
	H TO R	∞	∞
	A TO R	∞	∞
	F TO GRD	0	∞
L101	PIN TO PIN	0.4	0.4

* NOTE:
SET POWER SWITCH TO OFF, SET ANTENNA SELECTOR TO OMNI, DISCONNECT P612 FROM J612.

Figure 5-4. Antenna Coupling Circuits, Voltage and Resistance Chart





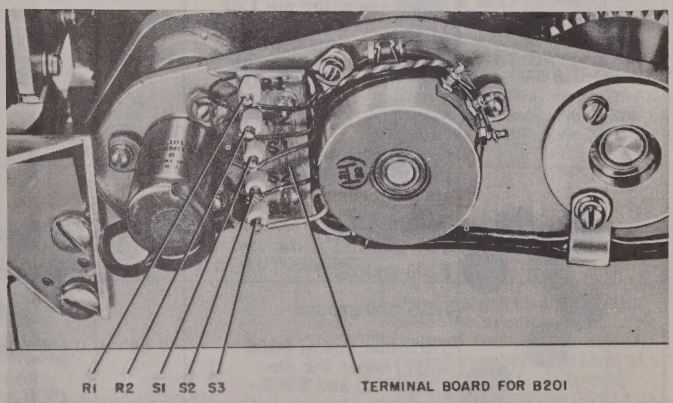


Figure 5-5. Tunable RF Circuits, Test Point Locations

TABLE 5-3. RADIO RECEIVING SET AN/BRR-3, TUNABLE RF CIRCUITS TROUBLE-SHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1 (cont.)	7	nect Electronic Multimeter ME-6B/U between terminal G on filter Z306 and ground. Adjust signal generator tuning control for maximum indication on electronic multimeter. Establish setting of RF GAIN MAN control R603 by adjusting it for 0.07 vac on electronic multimeter.		
	C	Connect red signal generator test lead to terminal end of R211 (suppressor for pin 1 of V203). Reduce signal generator output for an indication on electronic multimeter of 0.07 vac. Note signal generator output voltage.	Less than 200 uv	If indication is abnormal, substitute new 5749/6BA6W for V203. If trouble persists, perform voltage and resistance check at XV203 (see figure 5-6).
	C_1 C_2 C_2 C_3 C_3 C C_4 6 15	Set POWER switch S606 to OFF and check resistance between:		If resistance check does not reveal trouble, repeat signal check. If trouble in stage is still indicated or if resistance check indicates trouble, expose underside of the two RF head subassemblies (see Section 6, paragraph 6-6a) and perform resistance check at T205 and T206 (see figure 5-6).
		E210 and E211	5,500 to 7,000 ohms	
		E212 and E211	5,500 to 7,000 ohms	
		E211 and ground	∞ ohms	
		Terminal end of R211 (suppressor for pin 1 of V203) and E209	100 to 140 ohms	
		Terminal end of R216 (suppressor for pin 7 of V204) and outer terminal 11 on TB401	7,500 to 9,500 ohms	
2	B	Connect red signal generator test lead to terminal end of R206 (suppressor for pin 1 of V202). Reduce signal generator output for indication on Electronic Multimeter ME-6B/U of 0.07 vac. Note signal generator output voltage.	Less than 40 uv	If indication is abnormal, substitute new 5749/6BA6W for V202. If trouble persists, perform voltage and resistance check at XV202 (see figure 5-6).
	B_1 B_3 B_2 B_3 B_3 B C_4	Set POWER switch S606 to OFF and check resistance between:		If resistance check does not reveal trouble, repeat signal check. If trouble in stage is still indicated or if resistance check indicates trouble, expose underside of the two RF head subassemblies (see Section 6, paragraph 6-6a) and perform resistance check on T203 and T204 (see figure 5-6).
		E206 and E207	5,500 to 7,000 ohms	
		E208 and E207	5,500 to 7,000 ohms	
		E207 and ground	∞ ohms	
		Terminal end of R206 (suppressor for pin 1 of V202) and E209	7,500 to 9,500 ohms	

TABLE 5-3. RADIO RECEIVING SET AN/BRR-3, TUNABLE RF CIRCUITS TROUBLE-SHOOTING CHART
(Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
3	A A G	Connect red signal generator test lead to terminal E215 (grid circuit of V201). Connect Multimeter ME-25A/U for dc measurement between terminal E215 and ground. Advance RF GAIN MAN control R603 to that point where it produces no further change on Multimeter ME-25A/U (approximately -2.2 vdc). Disconnect multimeter. Connect Electronic Multimeter ME-6B/U between pin 1 of V208 and ground. Remove V208 and its shield. Verify that signal generator tuning control is set for maximum indication on electronic multimeter. Adjust signal generator output for indication on electronic multimeter of 0.7 vac. Note signal generator output voltage.		
	B	Connect red signal generator test lead to terminal end of R206 (suppressor for pin 1 of V202). Increase signal generator output for indication on electronic multimeter of 0.7 vac. Note signal generator output voltage. Replace V208 and its shield.	Ratio between two noted signal generator output voltages should be approximately 4:1	If indication is abnormal, substitute new 5749/6BA6W for V201. If trouble persists, perform voltage and resistance check at XV201 (see figure 5-6).
		Set POWER switch S606 to OFF and check resistance between:		If resistance check does not reveal trouble, repeat signal check. If trouble in stage is still indicated or if resistance check indicates trouble, expose underside of the two RF head subassemblies (see Section 6, paragraph 6-6a) and perform resistance check on T201 and T202 (see figure 5-6).
	A_1 A_3	E202 and E203	5,500 to 7,000 ohms	
	A_2 A_3	E204 and E203	5,500 to 7,000 ohms	
	A_3	E203 and ground	∞ ohms	
	A A_4	E215 and E201	70k to 80k	
4	NOTE This step should be omitted if Antenna Group AN/BRA-7(XN-1) or AN/BRA-8(XN-1) responds properly to adjustment of RF TUNING control on receiver when TUNING SELECTOR switch on Antenna Tuning Control Unit of Antenna Group is at AUTOMATIC.			
		Set POWER switch S606 to OFF. Disconnect connector P613 from J613. Check resistance between the following points on synchro transmitter B201 terminal board:		If indication is abnormal, unsolder synchro B201 leads at terminal board and repeat resistance check at synchro leads. If trouble persists, reconnect P613 and J613 and change B201 (see paragraph 5-7i).

TABLE 5-3. RADIO RECEIVING SET AN/BRR-3, TUNABLE RF CIRCUITS TROUBLE-SHOOTING CHART
(Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
4 (cont.)		S1 to S2	15 to 20 ohms	If indications are normal, connect P613 and J613 and check continuity between synchro B201 terminal board and J602 (28)
		S2 to S3	15 to 20 ohms	
		S1 to S3	15 to 20 ohms	
		R1 to R2	45 to 60 ohms	Check wiring between P602 and synchro in Antenna Group.
		R1 to S1	∞ ohms	
		R1 to ground	∞ ohms	
		S1 to ground	∞ ohms	
				Set TUNING SELECTOR switch on control unit of Antenna Group to AUTOMATIC and adjust synchro in control unit of Antenna Group for identical indications on FREQ. dial of receiver and FREQUENCY indicator of control unit (±0.1 kc).

h. MIXER AND VARIABLE BANDWIDTH IF CIRCUITS TROUBLE-SHOOTING CHART. - The procedure used to locate a trouble in the mixer and variable bandwidth IF circuits is contained in table 5-4. Figures 5-7, 5-8, and 6-34 should be referred to when using this table. In all stage gain measurements, momentarily reduce the signal generator output to zero. This momentary loss of signal ensures recognition that the output indication is the signal voltage and not the noise level.

TABLE 5-4. RADIO RECEIVING SET AN/BRR-3, MIXER AND VARIABLE BANDWIDTH IF CIRCUITS TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	(See figure 5-7.) (D)	Verify that RF TUNING control is set for 14 kc. Connect Multimeter ME-25A/U for ac measurement between pin 1 of XV204 and ground. Note indication on multimeter.	4 to 6 vac	
	(D1)	Short terminal E214 (on RF inductor deck near T207) to ground with a long screwdriver. Note indication on multimeter. Remove short and disconnect multimeter.	0 vac	If either indication is abnormal, substitute new 6AU6WA for V205. If trouble persists, perform voltage and resistance check at XV205 (see figure 5-8). Remove RF head as described in Section 6, paragraph 6-5a(1) and perform resistance check at T207 (see figure 5-8.)
2		Connect test lead CX-1363/U (containing an 0.1 uf blocking capacitor) to RF Signal Generator Set AN/URM-25D. Remove V206 and its shield. Verify that NOISE CANCEL switch		

TRANSFORMER	TERMINAL	RESISTANCE IN OHMS	
		TRANSFORMER IN CIRCUIT	TRANSFORMER OUT OF CIRCUIT
T201, T203, T205, T206	PG TO BK	120	120
	L TO H	1300	1300
	H TO PG	∞	∞
	H TO GRD	∞	∞
	PG TO GRD	∞	∞
T202, T204	PG TO BK	120	120
	L TO H	1300	1300
	H TO PG	∞	∞
	H TO GRD	∞	∞
	PG TO GRD	5500 (NOTE 5)	∞

NOTES:

1. REFER TO PARAGRAPH 5-4C FOR CONTROL SETTINGS. (POWER SWITCH MUST BE OFF DURING ALL RESISTANCE MEASUREMENTS).
2. DC AND FILAMENT VOLTAGE READINGS TAKEN TO GROUND WITH MULTMETER ME-25A/U.
3. DEPENDS ON RF TUNING FREQUENCY (SET TO 14KC).
4. ADJUST RF GAIN MAN TO PRODUCE -2.5VDC AT PIN 1 OF V201. (AGC-MAN SWITCH TO MAN).
5. SET RF TUNING TO 14KC.

Circuits, Voltage and Resistance Chart

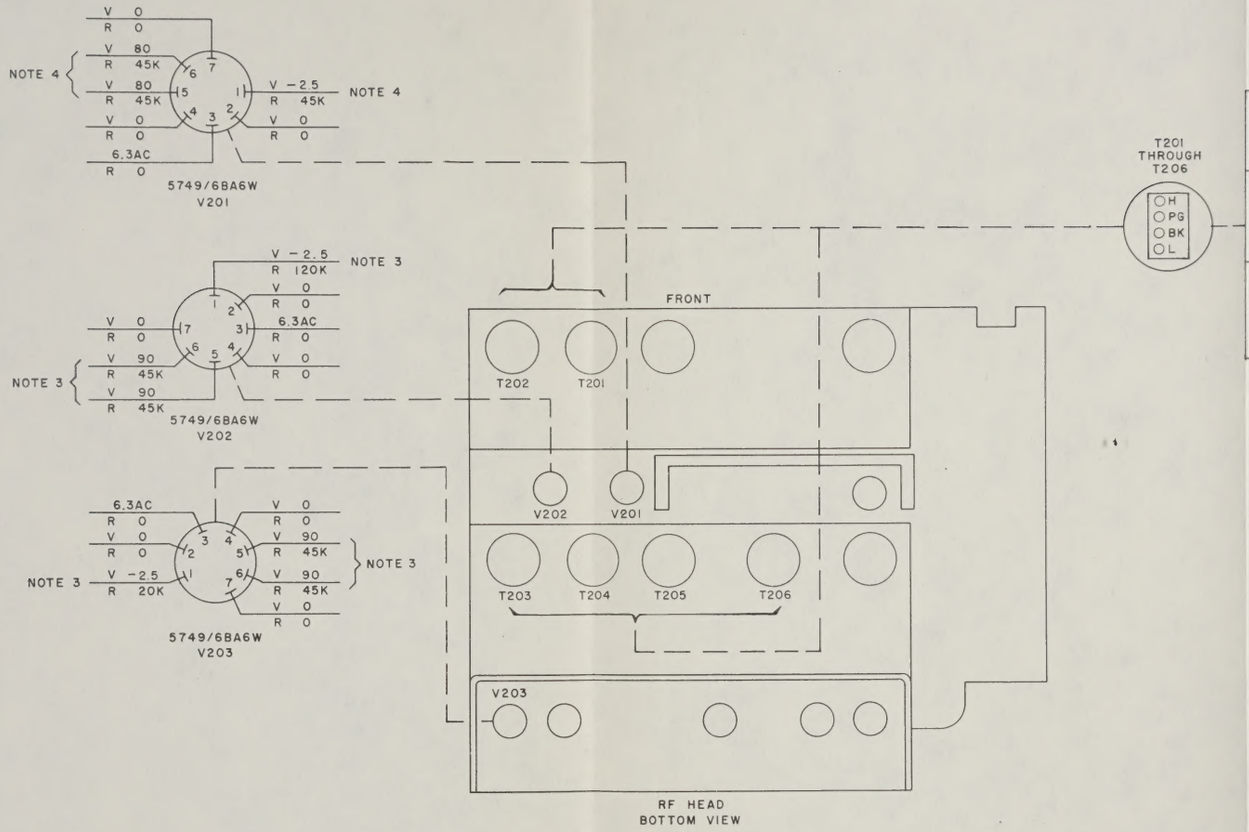
TABLE 5-3. RADIO RECEIVING SET AN/BRR-3, TUNABLE RF CIRCUITS TROUBLE-SHOOTING CHART
(Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
4 (cont.)		S1 to S2	15 to 20 ohms	If indications are normal, connect P613 and J613 and check continuity between synchro B201 terminal board and J602 (26)
		S2 to S3	15 to 20 ohms	
		S1 to S3	15 to 20 ohms	
		R1 to R2	45 to 60 ohms	Check wiring between P602 and synchro in Antenna Group.
		R1 to S1	∞ ohms	
		R1 to ground	∞ ohms	
		S1 to ground	∞ ohms	
				Set TUNING SELECTOR switch on control unit of Antenna Group to AUTOMATIC and adjust synchro in control unit of Antenna Group for identical indications on FREQ. dial of receiver and FREQUENCY indicator of control unit (±0.1 kc).

h. MIXER AND VARIABLE BANDWIDTH IF CIRCUITS TROUBLE-SHOOTING CHART. - The procedure used to locate a trouble in the mixer and variable bandwidth IF circuits is contained in table 5-4. Figures 5-7, 5-8, and 6-34 should be referred to when using this table. In all stage gain measurements, momentarily reduce the signal generator output to zero. This momentary loss of signal ensures recognition that the output indication is the signal voltage and not the noise level.

TABLE 5-4. RADIO RECEIVING SET AN/BRR-3, MIXER AND VARIABLE BANDWIDTH IF CIRCUITS TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	(See figure 5-7.) (D)	Verify that RF TUNING control is set for 14 kc. Connect Multimeter ME-25A/U for ac measurement between pin 1 of XV204 and ground. Note indication on multimeter.	4 to 6 vac	
	(D1)	Short terminal E214 (on RF inductor deck near T207) to ground with a long screwdriver. Note indication on multimeter. Remove short and disconnect multimeter.	0 vac	If either indication is abnormal, substitute new 6AU6WA for V205. If trouble persists, perform voltage and resistance check at XV205 (see figure 5-8). Remove RF head as described in Section 6, paragraph 6-5a(1) and perform resistance check at T207 (see figure 5-8.)
2		Connect test lead CX-1363/U (containing an 0.1 uf blocking capacitor) to RF Signal Generator Set AN/URM-25D. Remove V206 and its shield. Verify that NOISE CANCEL switch		



TRANSFORMER	TERMINAL	RESISTANCE IN OHMS	
		TRANSFORMER IN CIRCUIT	TRANSFORMER OUT OF CIRCUIT
T201, T203, T205, T206	PG TO BK	120	120
	L TO H	1300	1300
	H TO PG	∞	∞
	H TO GRD	∞	∞
	PG TO GRD	∞	∞
T202, T204	PG TO BK	120	120
	L TO H	1300	1300
	H TO PG	∞	∞
	H TO GRD	∞	∞
	PG TO GRD	5500 (NOTE 5)	∞

KEY TO SYMBOLS

V INDICATES DC VOLTAGE TO GROUND UNLESS OTHERWISE SPECIFIED.
AC INDICATES FILAMENT VOLTAGE TO GROUND UNLESS OTHERWISE SPECIFIED.
R INDICATES DC RESISTANCE.

NOTES:

1. REFER TO PARAGRAPH 5-4c FOR CONTROL SETTINGS. (POWER SWITCH MUST BE OFF DURING ALL RESISTANCE MEASUREMENTS).
2. DC AND FILAMENT VOLTAGE READINGS TAKEN TO GROUND WITH MULTMETER ME-25A/U.
3. DEPENDS ON RF TUNING FREQUENCY (SET TO 14KC).
4. ADJUST RF GAIN MAN TO PRODUCE -2.5VDC AT PIN 1 OF V201. (AGC-MAN SWITCH TO MAN).
5. SET RF TUNING TO 14KC.

Figure 5-6. Tunable RF Circuits, Voltage and Resistance Chart

TABLE 5-4. RADIO RECEIVING SET AN/BRR-3, MIXER AND VARIABLE BANDWIDTH IF CIRCUITS TROUBLE-SHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
2 (cont.)		S601 is set to NARROW and that FSK SENSE switch S603 is set to HOLD.		
	6	Connect Multimeter ME-25A/U for dc measurement between terminal end of R216 (suppressor for pin 7 of V204) and ground. Adjust RF GAIN MAN control R603 for -2.5 vdc on multimeter.		
	6	Adjust signal generator for 14 kc operation. Connect red signal generator test lead to terminal end of R216 (suppressor for pin 7 of V204) and connect black test lead to ground. Connect Electronic Multimeter ME-6B/U between terminal end of R216 (suppressor for pin 7 of V204) and ground. Adjust signal generator output for indication on electronic multimeter of 0.1 vac. (Signal generator output should be 50,000 uv.)		
	E	Connect electronic multimeter between pin 1 of V206 and ground.	Greater than 0.2 vac	
		Adjust RF TUNING control for maximum indication on electronic multimeter. Note indication.		
		Set NOISE CANCEL switch S601 to WIDE. Adjust RF TUNING control for maximum indication on electronic multimeter. Note indication.	Greater than 0.2 vac	If both indications are normal, replace V206 and its shield and proceed to step 3. If one indication is normal, perform resistance check at K201, Z201, Z202, and associated circuitry (see figure 5-8). NOTE Internal circuitry of Z201 and Z202 is not tested by this resistance check.

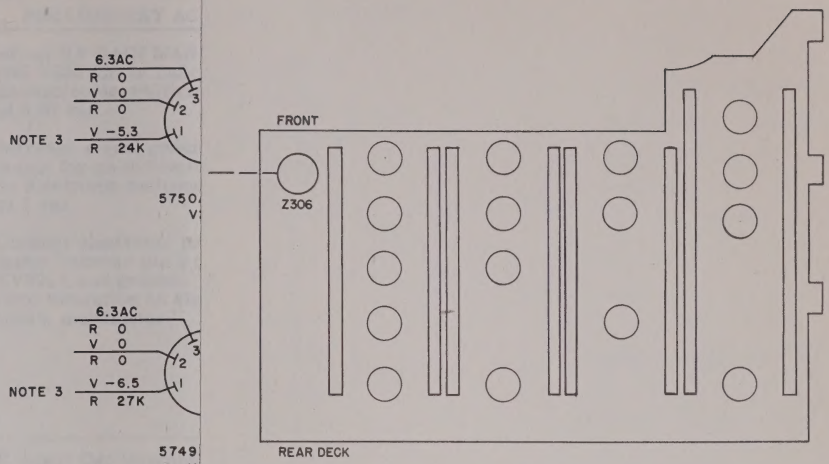
TABLE 5-4. RADIO RECEIVING SET AN/BRR-3, MIXER AND VARIABLE BANDWIDTH IF CIRCUITS TROUBLE-SHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
4 (cont.)				If indication is abnormal, substitute new 5749/6BA6W for V207. If trouble persists, perform voltage and resistance check at XV207 (see figure 5-8). NOTE Replace V208 and its shield.
5	J	Reduce signal generator output to 0 vac. Connect Electronic Multimeter ME-6B/U between terminal G on filter Z306 and ground. Adjust RF TUNING control for maximum indication on electronic multimeter. Adjust signal generator output for an indication on electronic multimeter of 5 vac.		
	G	Connect electronic multimeter between pin 1 of XV208 and ground. Note indication on electronic multimeter.	Less than 0.25 vac	If indication is abnormal, substitute new 5749/6BA6W for V208. If trouble persists, perform voltage and resistance check at XV208 (see figure 5-8). If still abnormal, check Z306 and associated circuitry (see figures 5-8, 6-34, and 6-35).

i. NOISE CANCELLATION AND NARROW BAND IF CIRCUITS TROUBLE-SHOOTING CHART. - The procedure used to locate a trouble in the noise cancellation and narrow band IF circuits is contained in table 5-5. Figures 5-2, 5-9, 5-10, and 6-35 should be referred to when using this table. In all stage gain measurements, momentarily reduce the signal generator output to zero. This momentary loss of signal ensures recognition that the output indication is the signal voltage and not the noise level.

TABLE 5-5. RADIO RECEIVING SET AN/BRR-3, NOISE CANCELLATION AND NARROW BAND IF CIRCUITS TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	I (See figure 5-2.)	Set RF TUNING control for indication of 16 on FREQ. dial. Verify that NOISE CANCEL switch S601 is set to NARROW. Connect RF Signal Generator Set AN/URM-25D to 50 OHM ANTENNA connector J603. Adjust signal generator for 5 uv output at 16 kc.		
	H (See figure 5-9 for this and all suc-	Connect Electronic Multimeter ME-6B/U between terminal G on filter Z306 and ground. Adjust signal generator tuning control for maximum indication on electronic multimeter; simultaneously		



COMPONENT	TERMINAL	RESISTANCE IN OHMS	
		COMPONENT IN CIRCUIT	COMPONENT OUT OF CIRCUIT
Z306 (NOTE 4)	P TO B	85	85
	G TO K	320	320
	G TO P	30K	∞
	G TO GRD	320	∞
	P TO GRD	30K	∞
T207 (NOTE 4)	G TO K	70	70
	H TO L	1,100	1,100
	H TO T	860	860
	H TO G	∞	∞
	H TO GRD	∞	∞
	K TO GRD	0	∞
Z201 (NOTE 4)	P TO B	150 (NOTE 5)	150
	G TO K	170 (NOTE 6)	170
	P TO GRD	60K (NOTE 7)	∞
	G TO GRD	65K (NOTE 8)	∞
Z202 (NOTE 4)	P TO B	85	85
	G TO K	320	320
	G TO P	60K	∞
	G TO GRD	30K	∞
	P TO GRD	30K	∞
K201	7 TO 8	0	0
	3 TO 4	0	0
	1 TO 5	8K	8 K
	6 TO 8	250	∞
	2 TO 4	480	∞
Z203	PIN TO PIN	185	185
	PIN TO GRD	60K	∞

EFER TO PARAGRARH 5-4C FOR CONTROL SETTINGS (POWER SWITCH
UST BE OFF DURING ALL RESISTANCE MEASUREMENTS).
C AND FILAMENT VOLTAGE READINGS TAKEN TO GROUND WITH MULTIMETER
E - 25 A/U.
DJUST RF GAIN MAN TO PRODUCE -6.5 VDC AT PIN 1 OF V206
GC - MAN SWITCH ON MAN).
NLY THE FIRST AND LAST FILTER INDUCTORS ARE CHECKED BY THESE
EASURMMENTS. IT IS NOT POSSIBLE TO CHECK THE INTERNAL CIRCUITRY
F THE FILTER BY RESISTANCE MEASUREMENTS.
HIS MEASUREMENT MAY BE MADE BETWEEN PINS 5 & 6 OF V204
HIS MEASUREMENT MAY BE MADE BETWEEN TERMINALS 4 OF K201 AND K OF Z202
HIS MEASUREMENT MAY BE MADE BETWEEN PIN 5 OF V204 AND GROUND
HIS MEASUREMENT MAY BE MADE BETWEEN PIN 1 OF V206 AND GROUND

KEY TO SYMBOL
V INDICATE
UNLESS
AC INDICAT
UNLESS
R INDICATE

ble IF Circuits, Voltage and Resistance Chart

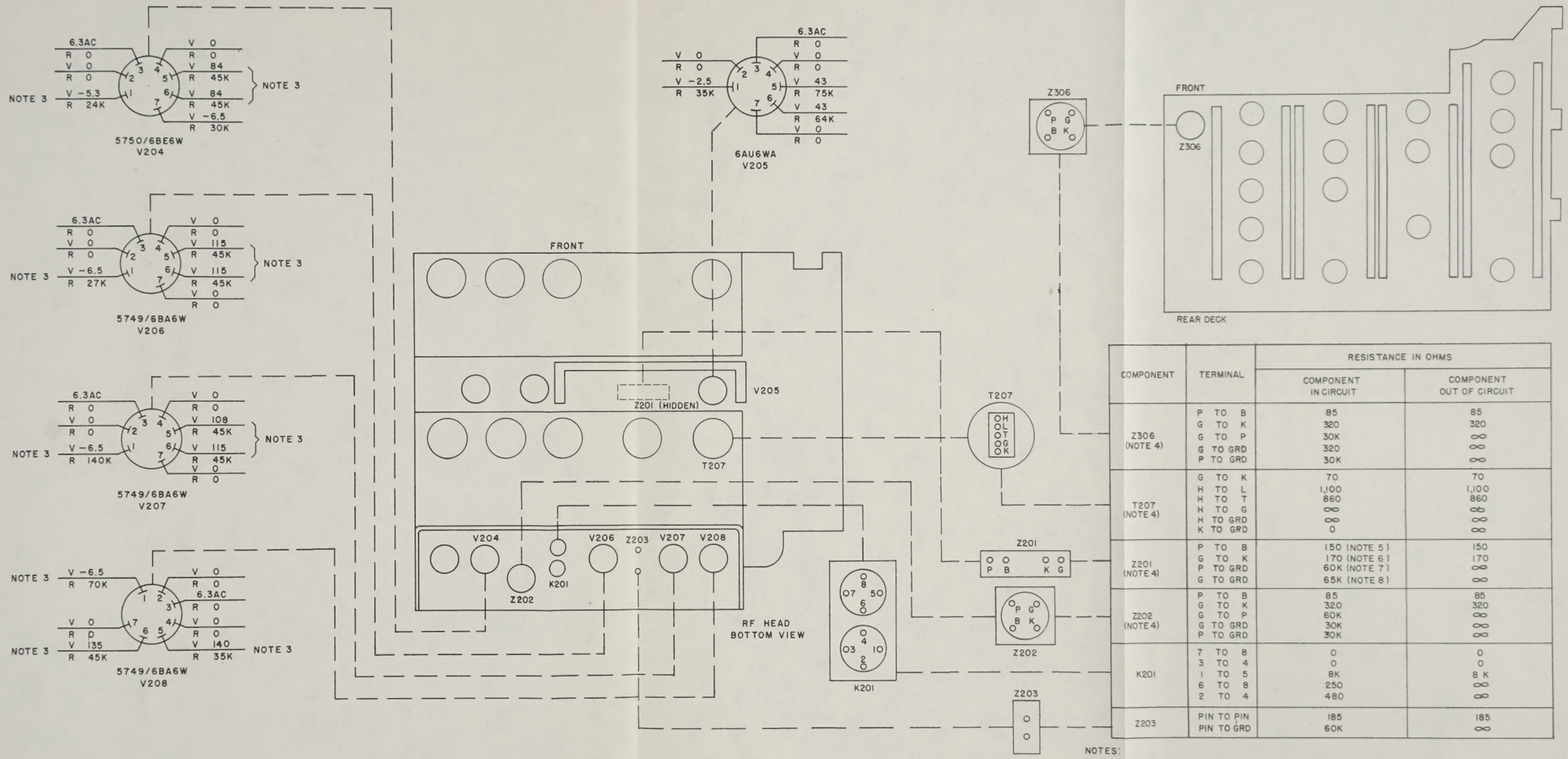
TABLE 5-4. RADIO RECEIVING SET AN/BRR-3, MIXER AND VARIABLE BANDWIDTH IF CIRCUITS TROUBLE-SHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
4 (cont.)				If indication is abnormal, substitute new 5749/6BA6W for V207. If trouble persists, perform voltage and resistance check at XV207 (see figure 5-8). NOTE Replace V208 and its shield.
5		Reduce signal generator output to 0 vac. Connect Electronic Multimeter ME-6B/U between terminal G on filter Z306 and ground. Adjust RF TUNING control for maximum indication on electronic multimeter. Adjust signal generator output for an indication on electronic multimeter of 5 vac.		
		Connect electronic multimeter between pin 1 of XV208 and ground. Note indication on electronic multimeter.	Less than 0.25 vac	If indication is abnormal, substitute new 5749/6BA6W for V208. If trouble persists, perform voltage and resistance check at XV208 (see figure 5-8). If still abnormal, check Z306 and associated circuitry (see figures 5-8, 6-34, and 6-35).

i. NOISE CANCELLATION AND NARROW BAND IF CIRCUITS TROUBLE-SHOOTING CHART. - The procedure used to locate a trouble in the noise cancellation and narrow band IF circuits is contained in table 5-5. Figures 5-2, 5-9, 5-10, and 6-35 should be referred to when using this table. In all stage gain measurements, momentarily reduce the signal generator output to zero. This momentary loss of signal ensures recognition that the output indication is the signal voltage and not the noise level.

TABLE 5-5. RADIO RECEIVING SET AN/BRR-3, NOISE CANCELLATION AND NARROW BAND IF CIRCUITS TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	 (See figure 5-2.)	Set RF TUNING control for indication of 16 on FREQ. dial. Verify that NOISE CANCEL switch S601 is set to NARROW. Connect RF Signal Generator Set AN/URM-25D to 50 OHM ANTENNA connector J603. Adjust signal generator for 5 uv output at 16 kc.		
	 (See figure 5-9 for this and all suc-	Connect Electronic Multimeter ME-6B/U between terminal G on filter Z306 and ground. Adjust signal generator tuning control for maximum indication on electronic multimeter; simultaneously		



COMPONENT	TERMINAL	RESISTANCE IN OHMS	
		COMPONENT IN CIRCUIT	COMPONENT OUT OF CIRCUIT
Z306 (NOTE 4)	P TO B	85	85
	G TO K	320	320
	G TO P	30K	∞
	G TO GRD	320	∞
	P TO GRD	30K	∞
T207 (NOTE 4)	G TO K	70	70
	H TO L	1,100	1,100
	H TO T	860	860
	H TO G	∞	∞
	H TO GRD	∞	∞
	K TO GRD	0	∞
Z201 (NOTE 4)	P TO B	150 (NOTE 5)	150
	G TO K	170 (NOTE 6)	170
	P TO GRD	60K (NOTE 7)	∞
	G TO GRD	65K (NOTE 8)	∞
Z202 (NOTE 4)	P TO B	85	85
	G TO K	320	320
	G TO P	60K	∞
	G TO GRD	30K	∞
	P TO GRD	30K	∞
K201	7 TO 8	0	0
	3 TO 4	0	0
	1 TO 5	8K	8 K
	6 TO 8	250	∞
	2 TO 4	480	∞
Z203	PIN TO PIN	185	185
	PIN TO GRD	60K	∞

KEY TO SYMBOLS

- V INDICATES DC VOLTAGE TO GROUND UNLESS OTHERWISE SPECIFIED.
- AC INDICATES FILAMENT VOLTAGE TO GROUND UNLESS OTHERWISE SPECIFIED.
- R INDICATES DC RESISTANCE.

NOTES:

1. REFER TO PARAGRARH 5-4C FOR CONTROL SETTINGS (POWER SWITCH MUST BE OFF DURING ALL RESISTANCE MEASUREMENTS).
2. DC AND FILAMENT VOLTAGE READINGS TAKEN TO GROUND WITH MULTIMETER ME-25 A/U.
3. ADJUST RF GAIN MAN TO PRODUCE -6.5 VDC AT PIN 1 OF V206 (AGC-MAN SWITCH ON MAN).
4. ONLY THE FIRST AND LAST FILTER INDUCTORS ARE CHECKED BY THESE MEASURMMENTS. IT IS NOT POSSIBLE TO CHECK THE INTERNAL CIRCUITRY OF THE FILTER BY RESISTANCE MEASUREMENTS.
5. THIS MEASUREMENT MAY BE MADE BETWEEN PINS 5 & 6 OF V204
6. THIS MEASUREMENT MAY BE MADE BETWEEN TERMINALS 4 OF K201 AND K OF Z202
7. THIS MEASUREMENT MAY BE MADE BETWEEN PIN 5 OF V204 AND GROUND
8. THIS MEASUREMENT MAY BE MADE BETWEEN PIN 1 OF V206 AND GROUND

Figure 5-8. Mixer and Variable IF Circuits, Voltage and Resistance Chart

TABLE 5-5. RADIO RECEIVING SET AN/BRR-3, NOISE CANCELLATION AND NARROW BAND IF CIRCUITS TROUBLE-SHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1 (cont.)	ceeding test points.)	adjust RF GAIN MAN control R603 for an indication on electronic multimeter of 0.07 vac. Increase signal generator output for an indication on electronic multimeter of 7 vac.		
	I	Connect electronic multimeter between pin 2 of XV301A and ground. Note indication on electronic multimeter.	0.5 to 0.7 vac	If indication is normal, proceed to step 3. If no voltage is present, check for direct short between test point L and ground. If indication is abnormal, proceed to step 2.
2	I	Connect Oscilloscope OS-8A/U between pin 2 of XV301A and ground. Adjust oscilloscope for dc coupling. Note pattern on oscilloscope.	Square wave pattern (approximately 1 volt peak-to-peak)	If top half of waveform is missing or round, replace CR306. If lower half of waveform is missing or round, replace CR305.
3		Decrease signal generator output for indication on Electronic Multimeter ME-6B/U of 0.07 vac.		
	J	Connect electronic multimeter between outer terminal 2 on TB301 and ground.	0.35 to 0.5 vac	If indication is abnormal, substitute new 5814A for V301. If trouble persists, perform voltage and resistance check at XV301A (see figure 5-10).
4		Verify that FSK SENSE switch S603 is set to HOLD. Remove V302 and its shield. Adjust signal generator for indication on Electronic Multimeter ME-6B/U of 0.2 vac.		
	K_1	Connect electronic multimeter between inner terminal 4 on TB301 and ground. Note indication on electronic multimeter.	0.14 to 0.2 vac	
	K_2	Connect electronic multimeter between outer terminal 5 on TB302 and ground. Note indication on electronic multimeter.	0.17 to 0.23 vac	If indication is abnormal, substitute new 5814A for V301. If trouble persists, perform voltage and resistance check at XV301B (see figure 5-10).
	K_3	Connect electronic multimeter between outer terminal 10 on TB301 and ground. Note indication on electronic multimeter.	0.1 to 0.15 vac	

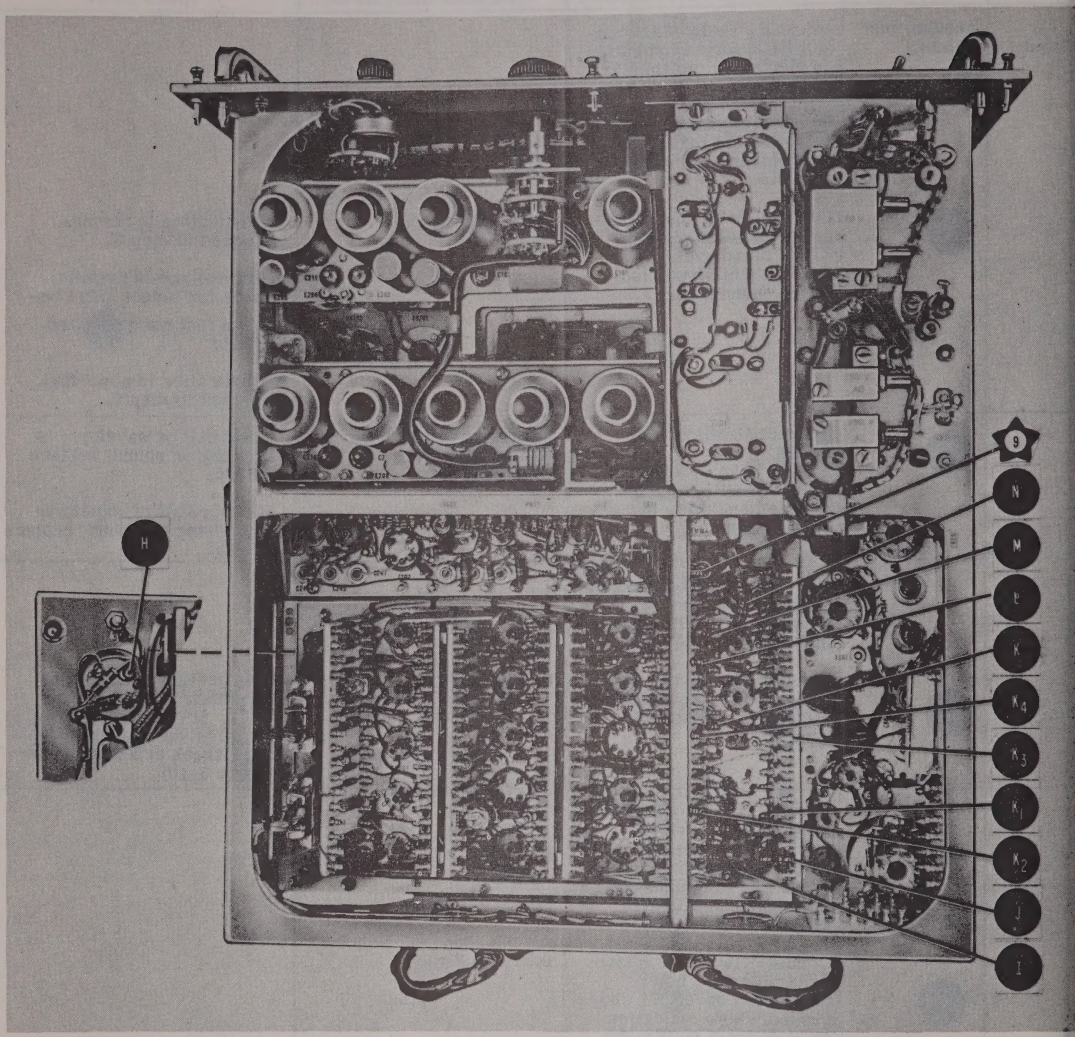


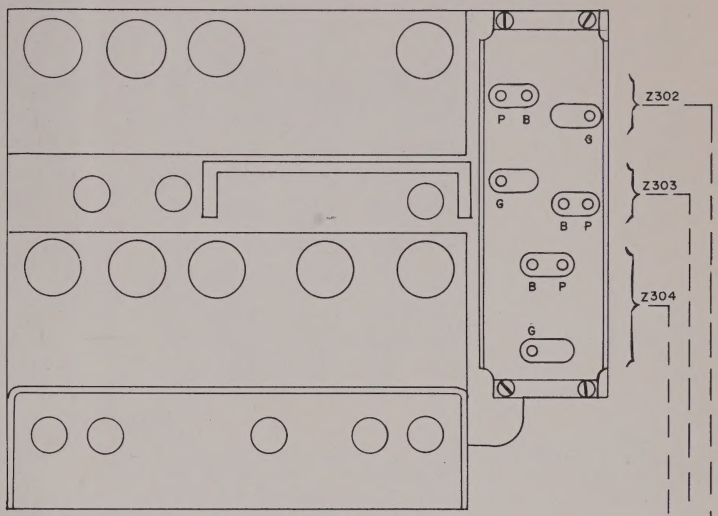
Figure 5-9. Noise Cancellation and Narrow Band IF Circuits, Test Point Locations

TABLE 5-5. RADIO RECEIVING SET AN/BRR-3, NOISE CANCELLATION AND NARROW BAND IF CIRCUITS TROUBLE-SHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
4 (cont.)	K_4	Connect electronic multimeter between outer terminal 10 on TB302 and ground. Note indication on electronic multimeter.	Less than 0.01 vac	
	K_3	Connect electronic multimeter between outer terminal 10 on TB301 and ground. Increase signal generator output until indication on electronic multimeter is 0.8 vac.		
	K_4	Connect electronic multimeter between outer terminal 10 on TB302 and ground. Note indication on electronic multimeter.	0.6 to 0.8 vac	
	K	Connect electronic multimeter between inner terminal 10 on TB302 and ground. Note indication on electronic multimeter.	Less than 0.05 vac	If indication is abnormal, perform continuity check at noise cancellation circuit.
5	J	Replace V302 and its shield. (Verify that tube is type 5814A.) Connect Electronic Multimeter ME-6B/U between outer terminal 2 on TB301 and ground. Carefully adjust RF TUNING control for exact maximum indication on electronic multimeter. Adjust signal generator output for indication on electronic multimeter of 0.2 vac. Record exact indication on FREQ. dial.		
	K_2	Connect electronic multimeter between outer terminal 5 on TB302 and ground. Rock RF TUNING control about its 'in tune' position. Note that indication on electronic multimeter increases on either side of 'in tune' position. Carefully adjust RF TUNING control for exact minimum indication on electronic multimeter and note indication. Record indication on FREQ. dial.	0.06 to 0.08 vac Less than 0.03 kc (1-1/2 small divisions) difference between the two recorded dial indications	If both indications are normal, proceed to step 6.
	K_3	Connect electronic multimeter between outer terminal 10 on TB301 and ground. Adjust signal generator output for indication on electronic multimeter of 0.12 vac.		

TABLE 5-5. RADIO RECEIVING SET AN/BRR-3, NOISE CANCELLATION AND NARROW BAND IF CIRCUITS TROUBLE-SHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
5 (cont.)	L	Connect electronic multimeter between outer terminal 15 on TB302 and ground. Adjust RF TUNING control for maximum indication on electronic multimeter and note indication.	0.4 to 0.5 vac	If indication is abnormal, substitute new 5814A for V302. If trouble persists, perform voltage and resistance check at XV302A and check resistance of Z301 (see figure 5-10).
	M	Measure voltage between inner terminal 16 on TB302 and ground, using electronic multimeter.	0.5 to 0.6 vac	If indication is abnormal, substitute new 5814A for V302. If trouble persists, perform voltage and resistance check at XV302B (see figure 5-10). If still abnormal, check circuit between test points M and K_2
6	K	Connect Electronic Multimeter ME-6B/U between inner terminal 10 on TB302 and ground. Verify that BAND WIDTH CPS switch S301 is set to 60. Adjust signal generator for 5 uv output. Adjust RF TUNING control for maximum indication on electronic multimeter; simultaneously adjust RF GAIN MAN control R603 for indication on electronic multimeter of 0.07 vac.		
	N	Connect electronic multimeter between pin 1 of V304 and ground. Note indication on electronic multimeter.	1.2 to 2.0 vac	
		Set BAND WIDTH CPS switch S301 to 120. Note indication on electronic multimeter.	1.2 to 2.0 vac	
		Set BAND WIDTH CPS switch S301 to 170. Note indication on electronic multimeter.	1.2 to 2.0 vac	If all indications are abnormal, substitute new 6AU6WA for V303. If trouble persists, perform voltage and resistance check at XV303 (see figure 5-10). If still abnormal, check S301 circuit. If one indication is abnormal, check S301 circuit and filter associated with faulty switch position (see figure 5-10).



COMPONENT	TERMINAL	RESISTANCE IN OHMS	
		COMPONENT IN CIRCUIT	COMPONENT OUT OF CIRCUIT
Z304 NOTE 5	P TO B	80	80
	P TO GRD	40K	∞
	G TO GRD	11	11
Z303 NOTE 5	P TO B	80	80
	P TO GRD	40K	∞
	G TO GRD	50	50
Z302 NOTE 5	P TO B	75	75
	P TO GRD	40K	∞
	G TO GRD	50	50
Z305	PIN TO PIN	80	80
Z301	PIN TO PIN	85	85
	PIN TO GRD	35K	∞

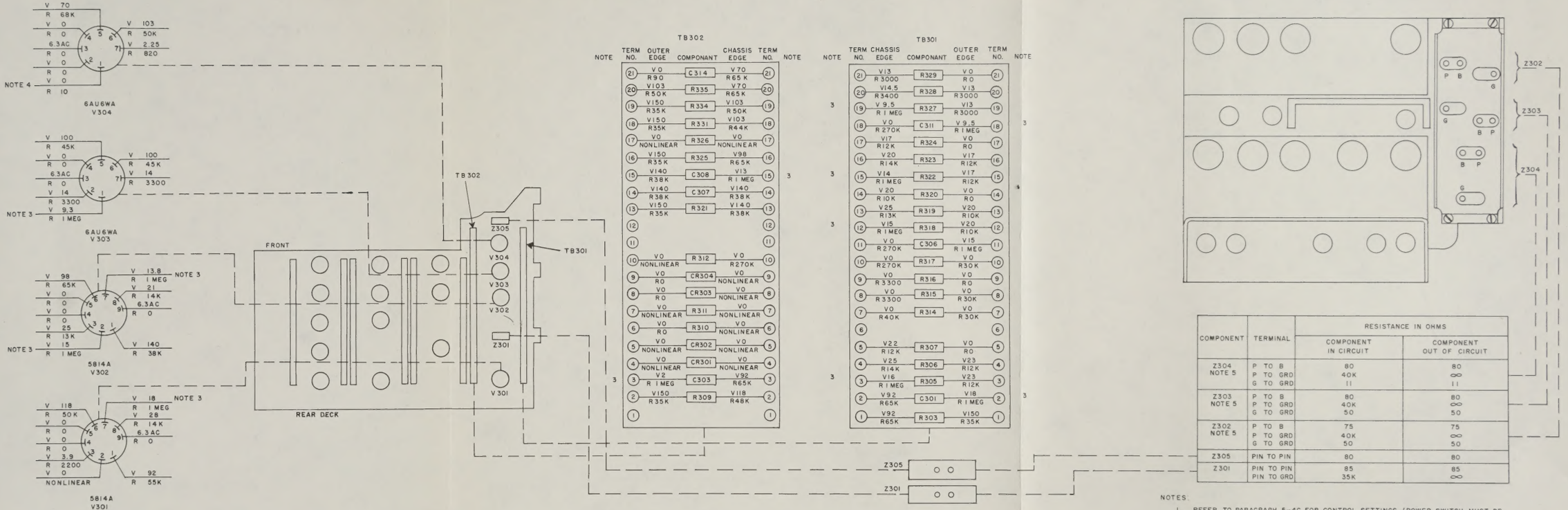
NOTES:

1. REFER TO PARAGRAPH 5-4C FOR CONTROL SETTINGS. (POWER SWITCH MUST BE OFF DURING ALL RESISTANCE MEASUREMENTS).
2. DC AND FILAMENT VOLTAGE READINGS TAKEN TO GROUND WITH MULTIMETER ME-25A/U.
3. HIGH IMPEDANCE READING IS DEPENDENT ON METER INPUT IMPEDANCE.
4. VALUE CHANGES WITH POSITION OF BANDWIDTH CPS SETTING (BANDWIDTH CPS ON 60).
5. ONLY THE FIRST AND LAST FILTER INDUCTORS ARE CHECKED BY THESE MEASUREMENTS. IT IS NOT POSSIBLE TO CHECK THE INTERNAL CIRCUITRY OF THE FILTER BY RESISTANCE MEASUREMENTS.

Figure 5-10. Noise Cancellation and Narrow Band IF Circuits, Voltage and Resistance Chart

TABLE 5-5. RADIO RECEIVING SET AN/BRR-3, NOISE CANCELLATION AND NARROW BAND IF CIRCUITS TROUBLE-SHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
5 (cont.)	L	Connect electronic multimeter between outer terminal 15 on TB302 and ground. Adjust RF TUNING control for maximum indication on electronic multimeter and note indication.	0.4 to 0.5 vac	If indication is abnormal, substitute new 5814A for V302. If trouble persists, perform voltage and resistance check at XV302A and check resistance of Z301 (see figure 5-10).
	M	Measure voltage between inner terminal 16 on TB302 and ground, using electronic multimeter.	0.5 to 0.6 vac	If indication is abnormal, substitute new 5814A for V302. If trouble persists, perform voltage and resistance check at XV302B (see figure 5-10). If still abnormal, check circuit between test points M and K_2
6	K	Connect Electronic Multimeter ME-6B/U between inner terminal 10 on TB302 and ground. Verify that BAND WIDTH CPS switch S301 is set to 60. Adjust signal generator for 5 uv output. Adjust RF TUNING control for maximum indication on electronic multimeter; simultaneously adjust RF GAIN MAN control R603 for indication on electronic multimeter of 0.07 vac.		
	N	Connect electronic multimeter between pin 1 of V304 and ground. Note indication on electronic multimeter.	1.2 to 2.0 vac	
		Set BAND WIDTH CPS switch S301 to 120. Note indication on electronic multimeter.	1.2 to 2.0 vac	
		Set BAND WIDTH CPS switch S301 to 170. Note indication on electronic multimeter.	1.2 to 2.0 vac	If all indications are abnormal, substitute new 6AU6WA for V303. If trouble persists, perform voltage and resistance check at XV303 (see figure 5-10). If still abnormal, check S301 circuit. If one indication is abnormal, check S301 circuit and filter associated with faulty switch position (see figure 5-10).



COMPONENT	TERMINAL	RESISTANCE IN OHMS	
		COMPONENT IN CIRCUIT	COMPONENT OUT OF CIRCUIT
Z304 NOTE 5	P TO B	80	80
	P TO GRD	40K	∞
	G TO GRD	11	11
Z303 NOTE 5	P TO B	80	80
	P TO GRD	40K	∞
	G TO GRD	50	50
Z302 NOTE 5	P TO B	75	75
	P TO GRD	40K	∞
	G TO GRD	50	50
Z305	PIN TO PIN	80	80
Z301	PIN TO PIN	85	85
	PIN TO GRD	35K	∞

KEY TO SYMBOLS

V	INDICATES DC VOLTAGE TO GROUND UNLESS OTHERWISE SPECIFIED
AC	INDICATES AC VOLTAGE TO GROUND UNLESS OTHERWISE SPECIFIED
R	INDICATES DC RESISTANCE

NOTES:

1. REFER TO PARAGRAPH 5-4C FOR CONTROL SETTINGS. (POWER SWITCH MUST BE OFF DURING ALL RESISTANCE MEASUREMENTS).
2. DC AND FILAMENT VOLTAGE READINGS TAKEN TO GROUND WITH MULTIMETER ME-25A/U.
3. HIGH IMPEDANCE READING IS DEPENDENT ON METER INPUT IMPEDANCE.
4. VALUE CHANGES WITH POSITION OF BANDWIDTH CPS SETTING (BANDWIDTH CPS ON 60).
5. ONLY THE FIRST AND LAST FILTER INDUCTORS ARE CHECKED BY THESE MEASUREMENTS. IT IS NOT POSSIBLE TO CHECK THE INTERNAL CIRCUITRY OF THE FILTER BY RESISTANCE MEASUREMENTS.

Figure 5-10. Noise Cancellation and Narrow Band IF Circuits, Voltage and Resistance Chart

TABLE 5-5. RADIO RECEIVING SET AN/BRR-3, NOISE CANCELLATION AND NARROW BAND IF CIRCUITS TROUBLE-SHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
7	9	Measure ac voltage between outer terminal 21 on TB302 and ground with Electronic Multimeter ME-6B/U.	1.5 to 2.5 vac	If indication is abnormal, substitute new 6AU6WA for V304. If trouble persists, perform voltage and resistance check at XV304 (see figure 5-10). If still abnormal, check Z305 (see figure 5-10).

j. AUDIO CIRCUITS TROUBLE-SHOOTING CHART. - The procedure used to locate trouble in the audio circuits is contained in table 5-6. Figures 5-2, 5-11, 5-12, and 6-36 should be referred to when using this table. In all stage gain measurements, momentarily reduce the signal generator output to zero. This momentary loss of signal ensures recognition that the output indication is the signal voltage and not the noise level.

TABLE 5-6. RADIO RECEIVING SET AN/BRR-3, AUDIO CIRCUITS TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	1 (See figure 5-2.) 0 (See figure 5-11 for this and all succeeding test points.)	Connect RF Signal Generator Set AN/URM-25D to 50 OHM ANTENNA connector J603. Adjust signal generator for 5 uv output at 14 kc. Adjust RF TUNING control for maximum vertical deflection on crt indicator V601; simultaneously adjust RF GAIN MAN control R603 for square pattern. Verify that AUDIO switch S602 is set to 2500. Connect Electronic Multimeter ME-6B/U between pin 2 of XV403A and ground. Set AUDIO-LEVEL control R602 to 10. Note indication on electronic multimeter.	0.5 to 1.0 vac	If indication is abnormal, check grid circuit of V403A.
		Set AUDIO-LEVEL control R602 to 0. Note indication on electronic multimeter.	Less than 0.005 vac	If indication is abnormal, check R602 circuit and C601.
2		Set AUDIO-LEVEL control R602 to 10. Set AUDIO switch S602 to 1000. Note indication on electronic multimeter.	0.7 to 1.4 vac	
		Set AUDIO switch S602 to 600. Note indication on electronic multimeter.	0.7 to 1.4 vac	If both indications are normal, proceed to step 3. If an indication is abnormal, proceed to step 5.
3		Set AUDIO switch S602 to 2500. Set AUDIO-LEVEL control R602 for indication on Electronic Multimeter ME-6B/U of 0.4 vac.		

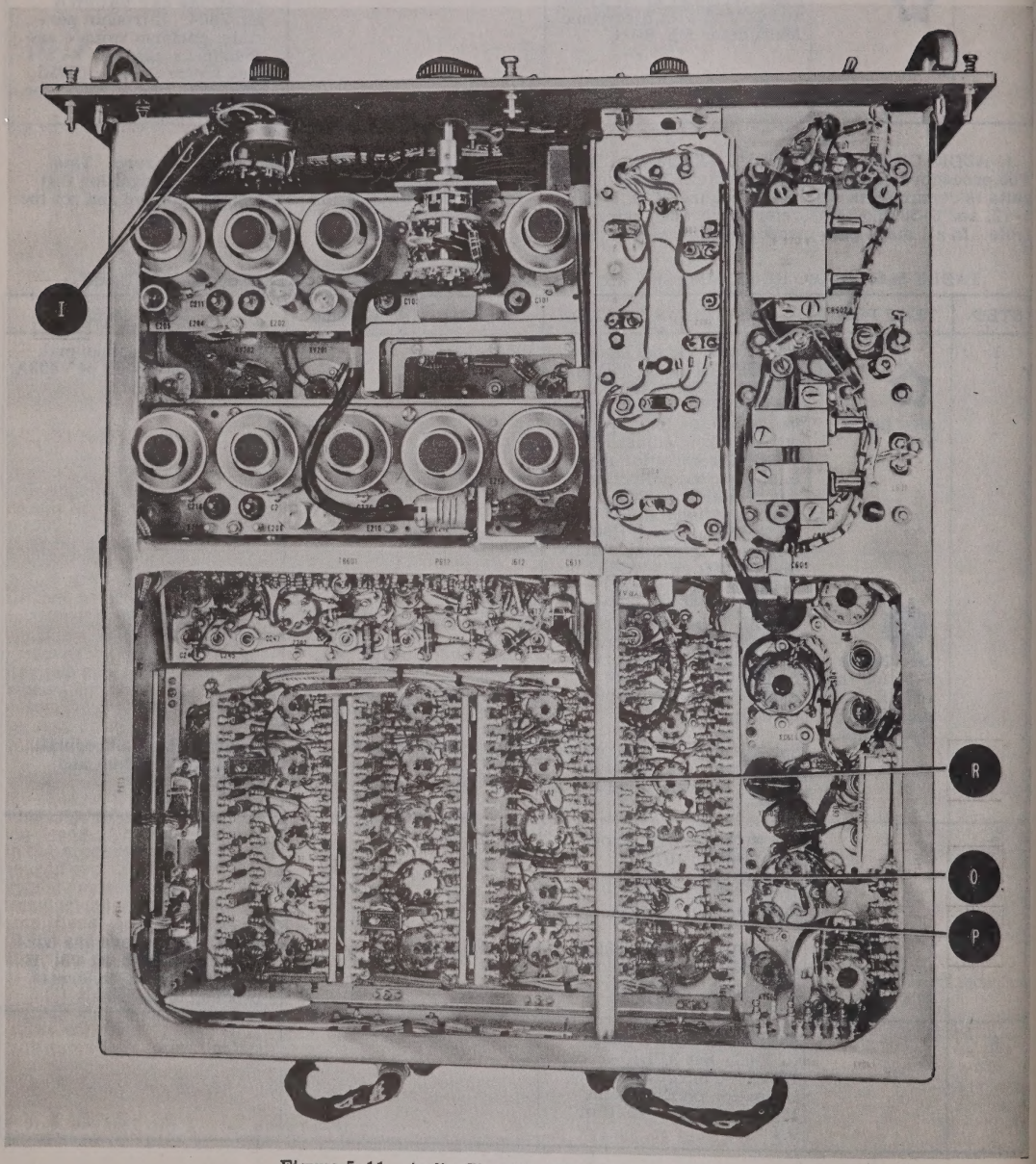
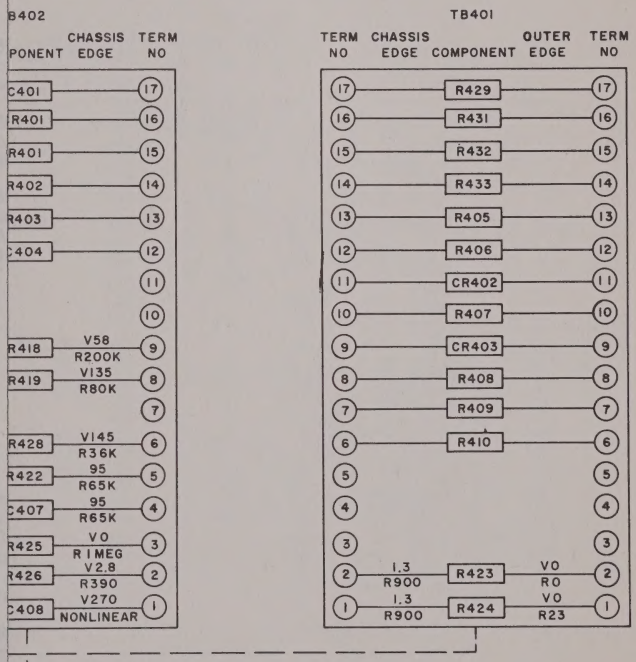


Figure 5-11. Audio Circuits, Test Point Locations

AL	RESISTANCE IN OHMS	
	COMPONENT IN CIRCUIT	COMPONENT OUT OF CIRCUIT
5	1K	1K
6	25	25
7	25	25
7	∞	∞
6	NONLINEAR	∞
GRD	0	∞
1	170K	∞
1	170K	∞
1	1MEG	1MEG
1	∞	∞
1	65K	∞
1	65K	∞
1	400	400
1	1200	1200
2	2	2
6	700	700
3	0	0
4	0	0
5	8K	8K
1	∞	∞
3	1600	∞



APH 5-4C FOR CONTROL SETTINGS (POWER SWITCH MUST BE OFF
STANCE MEASUREMENTS).
VOLTAGE READINGS TAKEN TO GROUND WITH MULTIMETER

ITH AUDIO LEVEL KNOB (SET TO ZERO).
E TO COMPLETELY CHECK THE INTERNAL CIRCUITRY OF THE
ANCE MEASUREMENTS.

cuits, Voltage and Resistance Chart

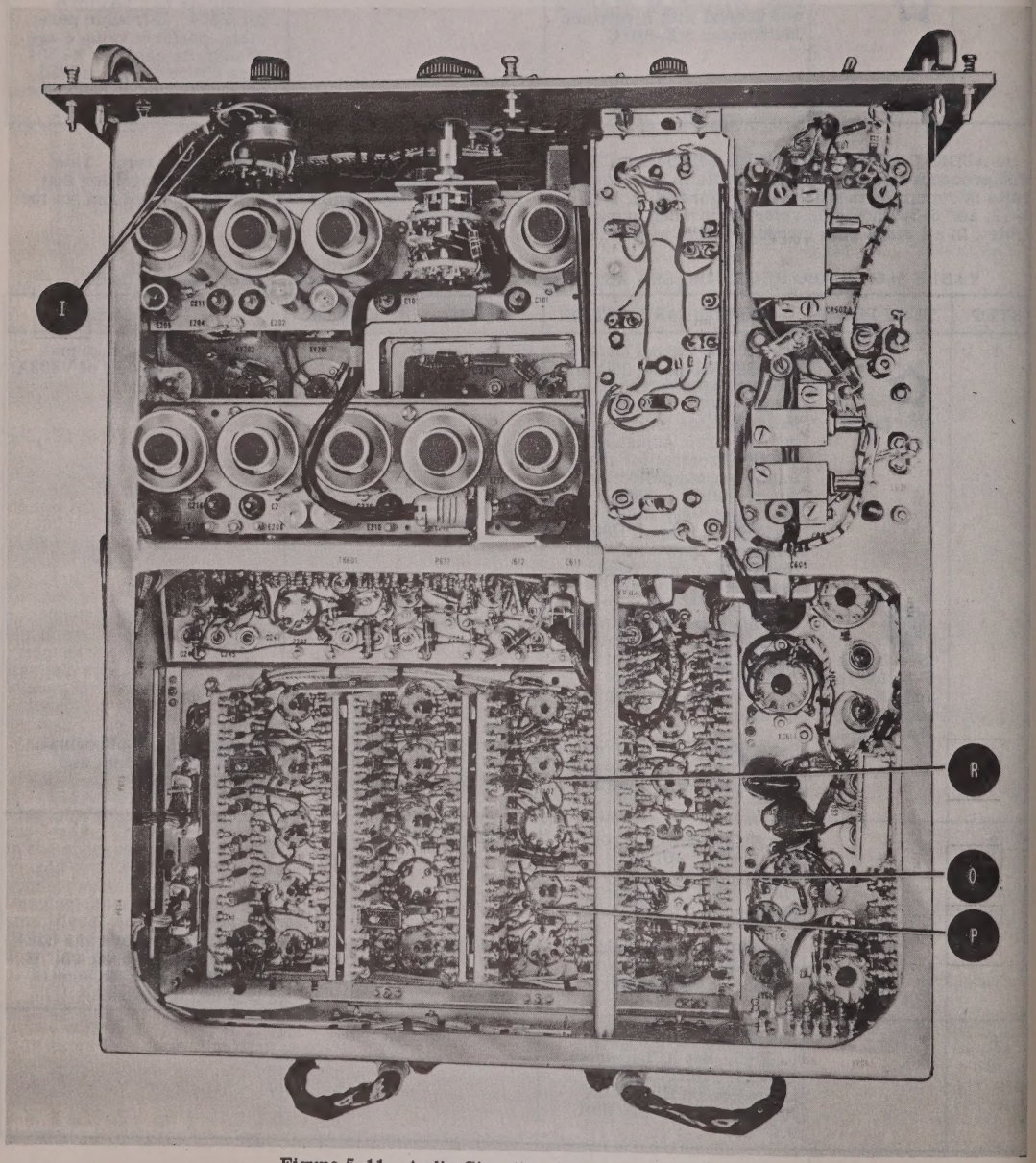
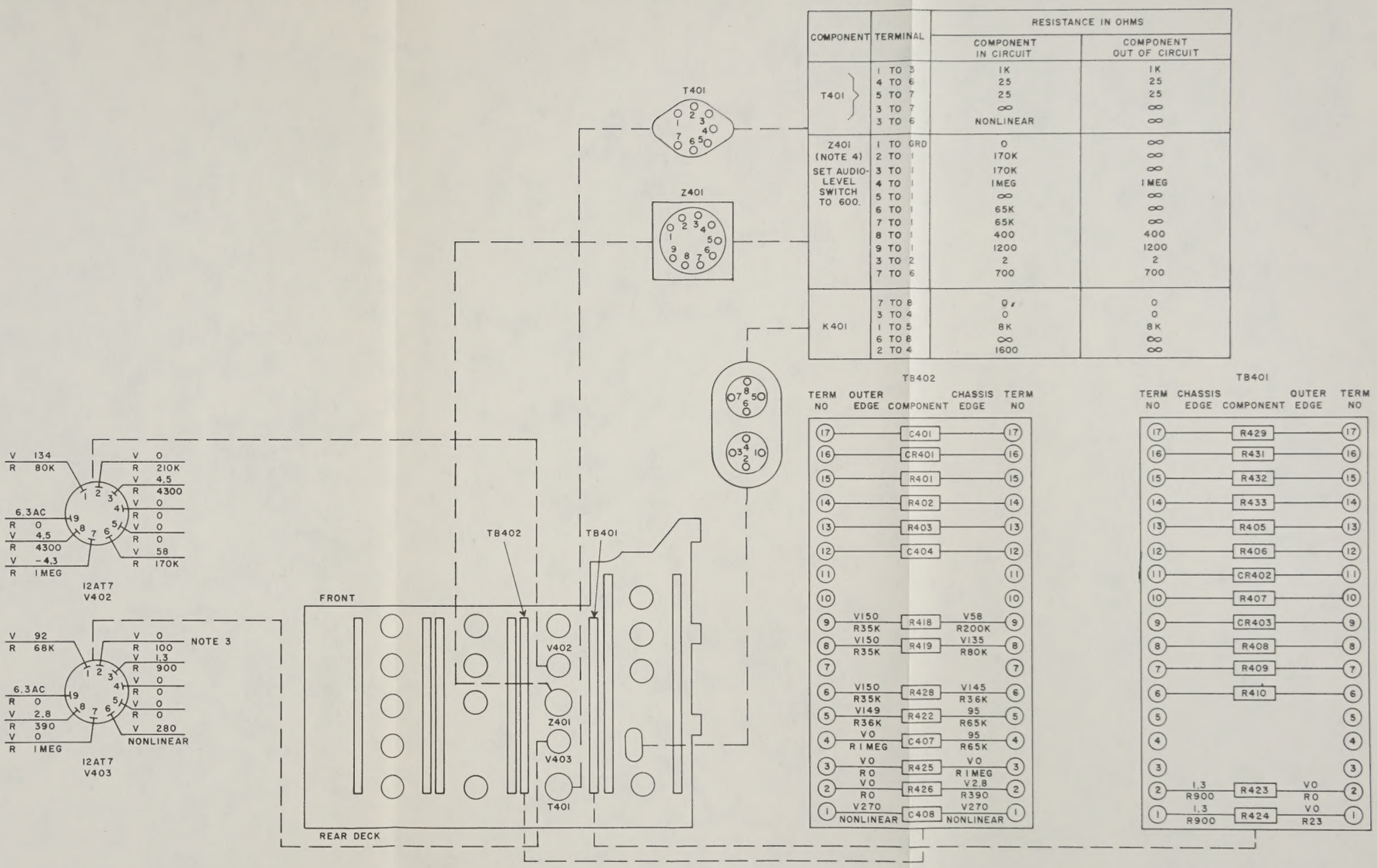


Figure 5-11. Audio Circuits, Test Point Locations

COMPONENT	TERMINAL	RESISTANCE IN OHMS: COMPONENT IN CIRCUIT	RESISTANCE IN OHMS: COMPONENT OUT OF CIRCUIT
T401	1 TO 3	1K	1K
	4 TO 6	25	25
	5 TO 7	25	25
	3 TO 7	∞	∞
	3 TO 6	NONLINEAR	∞
Z401 (NOTE 4) SET AUDIO-LEVEL SWITCH TO 600.	1 TO GRD	0	∞
	2 TO 1	170K	∞
	3 TO 1	170K	∞
	4 TO 1	1MEG	1MEG
	5 TO 1	∞	∞
	6 TO 1	65K	∞
	7 TO 1	65K	∞
	8 TO 1	400	400
	9 TO 1	1200	1200
	3 TO 2	2	2
	7 TO 6	700	700
K401	7 TO 8	0	0
	3 TO 4	0	0
	1 TO 5	8K	8K
	6 TO 8	∞	∞
	2 TO 4	1600	∞



KEY TO SYMBOLS

V INDICATES DC VOLTAGE TO GROUND UNLESS OTHERWISE SPECIFIED.
AC INDICATES FILAMENT VOLTAGE TO GROUND UNLESS OTHERWISE SPECIFIED.
R INDICATES DC RESISTANCE.

NOTES:

1. REFER TO PARAGRAPH 5-4C FOR CONTROL SETTINGS (POWER SWITCH MUST BE OFF DURING ALL RESISTANCE MEASUREMENTS).
2. DC AND FILAMENT VOLTAGE READINGS TAKEN TO GROUND WITH MULTIMETER ME-25A/U.
3. VALUE CHANGES WITH AUDIO LEVEL KNOB (SET TO ZERO).
4. IT IS NOT POSSIBLE TO COMPLETELY CHECK THE INTERNAL CIRCUITRY OF THE FILTER BY RESISTANCE MEASUREMENTS.

Figure 5-12. Audio Circuits, Voltage and Resistance Chart

TABLE 5-6. RADIO RECEIVING SET AN/BRR-3, AUDIO CIRCUITS TROUBLE-SHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
3 (cont.)	P	Measure ac voltage between pin 7 of V403B and ground using electronic multimeter.	0.7 to 1.7 vac	If indication is abnormal, substitute new 12AT7WA for V403. If trouble persists, perform voltage and resistance check at XV403A and B (see figure 5-12). If still abnormal, check V403A cathode circuit (see figure 5-12).
4	Q	Measure ac voltage across R601 using Electronic Multimeter ME-6B/U. NOTE R601 is not grounded to chassis.	1.5 to 2.7 vac	If indication is abnormal, check T401 and associated circuitry (see figure 5-12).
5	R	Connect Electronic Multimeter ME6-B/U between pin 6 of XV402 and ground. Note indication on electronic multimeter.	0.7 to 1.5 vac	
		Set AUDIO switch S602 to 1000. Note indication on electronic multimeter.	0.7 to 1.5 vac	
		Set AUDIO switch S602 to 600. Note indication on electronic multimeter.	0.7 to 1.5 vac	
	O	Set AUDIO switch S602 to 1000. Measure voltage between pin 2 of V403A and ground using electronic multimeter.	0.5 to 1.0 vac	If indication is abnormal in one switch position, check S602, K401, Z401, and associated circuitry (see figure 5-12). If indications are abnormal in both switch positions, substitute new 12AT7WA for V402. If trouble persists, perform voltage and resistance check at XV402 (see figure 5-12). If still abnormal, check Z401 and associated circuitry (see figure 5-12).

k. FSK DETECTING CIRCUITS TROUBLE-SHOOTING CHART. - The procedure used to locate trouble in the FSK detecting circuits is contained in table 5-7. Figures 5-2, 5-13, 5-14, and 6-37 should be referred to when using this table. In all stage gain measurements, momentarily reduce the signal generator output to zero. This momentary loss of signal ensures recognition that the output indication is the signal voltage and not the noise level.

TABLE 5-7. RADIO RECEIVING SET AN/BRR-3, FSK DETECTING CIRCUITS TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	I (See figure 5-2.)	Connect RF Signal Generator Set AN/URM-25D to 50 OHM ANTENNA connector V603. Adjust signal generator for 5 uv output at 16 kc. Adjust RF TUNING control to 16 kc. Fine		

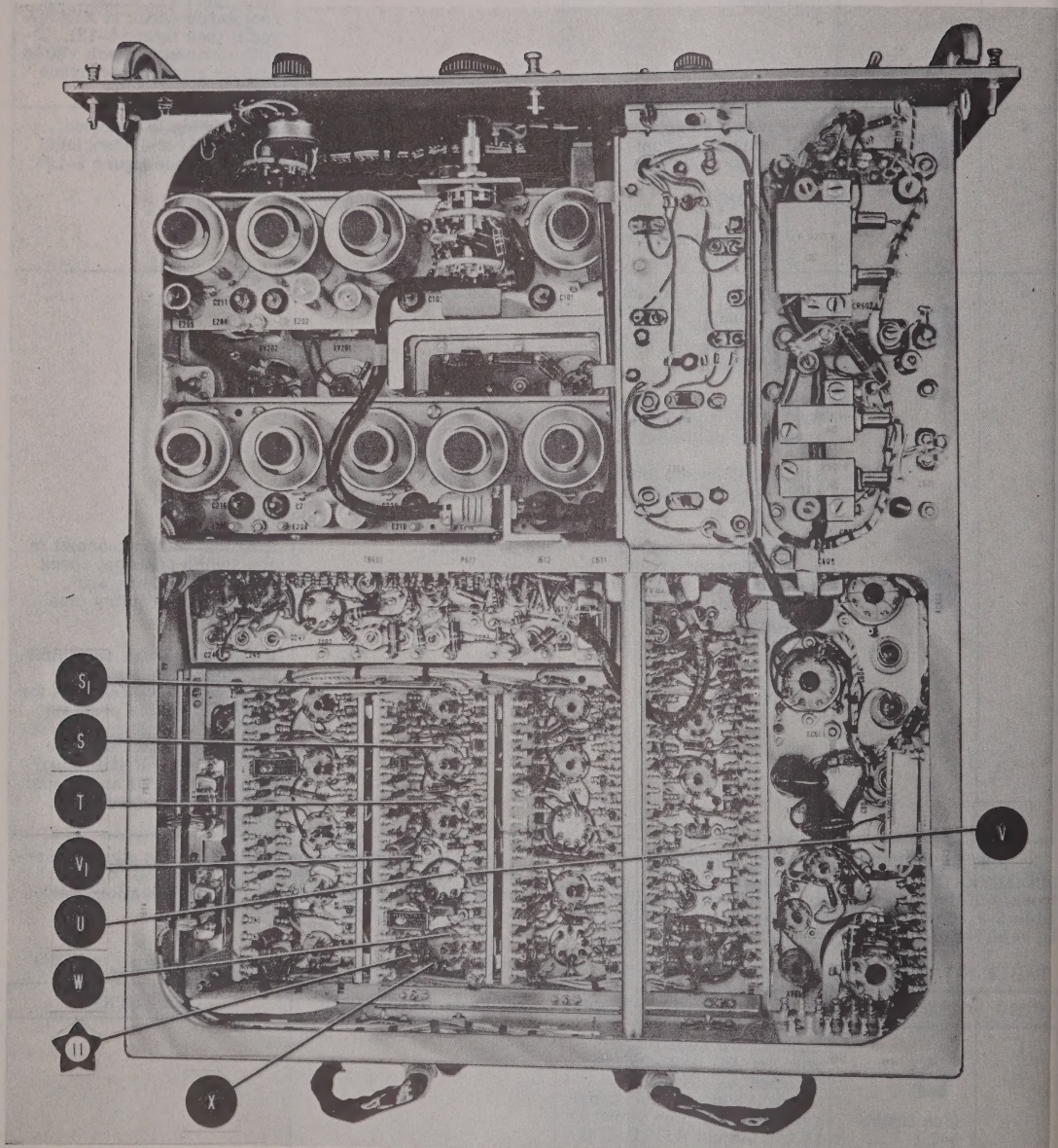


Figure 5-13. FSK Detecting Circuits, Test Point Locations

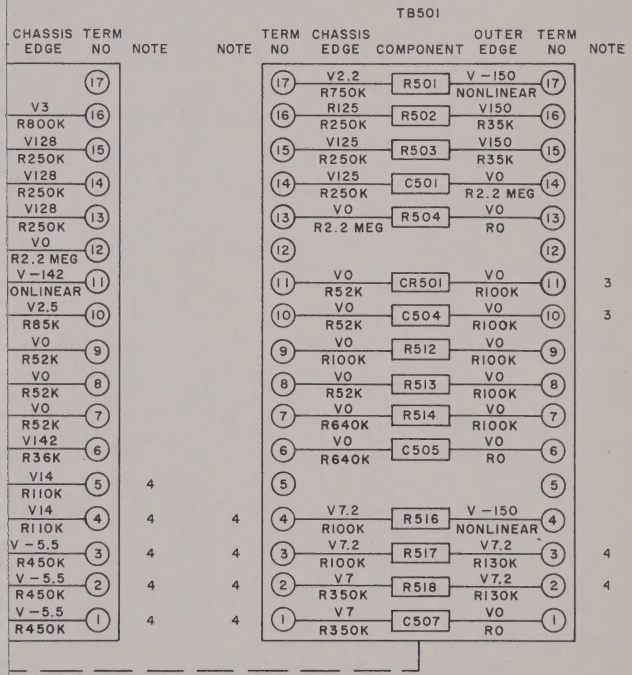
TABLE 5-7. RADIO RECEIVING SET AN/BRR-3, FSK DETECTING CIRCUITS TROUBLE-SHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1 (cont.)		tune RF TUNING control for maximum vertical deflection on crt indicator V601; simultaneously adjust RF GAIN MAN control R603 for square pattern. Verify that CRT switch S605 is set to SET LEVEL and that FSK SENSE switch S603 is set to HOLD.		
	S_1 (See figure 5-13 for this and all succeeding test points.)	Connect Electronic Multimeter ME-6B/U between pin 2 of V501 and ground. Note indication on electronic multimeter.	Less than 0.001 vac	
		Set CRT switch S605 to FSK TUNE. Adjust RF TUNING control for maximum indication on electronic multimeter and note indication.	1.5 to 2.5 vac	If indication is abnormal, check grid circuit of V501.
		Set FSK SENSE switch S603 to NORM and then to REV.	Indication on electronic multimeter should remain unchanged.	If indication is abnormal in either switch position, perform continuity check at V501 grid circuit.
2		Set CRT switch S605 to SET LEVEL. Set FSK SENSE switch S603 to NORM. Adjust signal generator for 1,000 uv output. Adjust RF GAIN MAN control R603 for indication on Electronic Multimeter ME-6B/U of 1.5 vac. Remove V502 and its shield.		
	S	Measure ac voltage between pin 2 of XV502 and ground using electronic multimeter.	7 to 15 vac	
		Reduce signal generator output for indication on electronic multimeter of 7 vac.		
	S_1	Measure ac voltage between pin 2 of XV501 and ground using electronic multimeter.	0.5 to 1.0 vac	If indication is abnormal, substitute new 5751 for V501. If trouble persists, perform voltage and resistance check at XV501 (see figure 5-14).
3		Replace V502 and its shield. Remove V503 and its shield. Measure ac	5 to 20 vac	

TABLE 5-7. RADIO RECEIVING SET AN/BRR-3, FSK DETECTING CIRCUITS TROUBLE-SHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
3 (cont.)	T	voltage between pin 2 of XV503 and ground using Electronic Multimeter ME-6B/U. Reduce signal generator output of indication on electronic multimeter of 5 vac.		
	S	Measure ac voltage between pin 2 of XV502 and ground using electronic multimeter.	0.25 to 0.50 vac	If indication is abnormal, substitute new 5751 for V502. If trouble persists, perform voltage and resistance check at XV502 (see figure 5-14).
4	U	Replace V503 and its shield. Measure ac voltage between terminal P of Z501 and ground using Electronic Multimeter ME-6B/U.	25 to 50 vac	If indication is abnormal, substitute new 12AT7WA for V503. If trouble persists, perform voltage and resistance check at XV503 (see figure 5-14). If still abnormal, check Z501 (see figure 5-14).
5	S_1	Connect Electronic Multimeter ME-6B/U between pin 2 of XV501 and ground. Adjust signal generator output for indication on electronic multimeter of 5 uv. Adjust RF GAIN MAN control R603 for square pattern on crt indicator V601. Verify that RF TUNING control is adjusted for maximum indication on electronic multimeter.		
	V	Connect Multimeter ME-25A/U for dc measurement between inner terminal 6 on TB501 and ground. Note indication on multimeter.	-1 to +1 vdc	
		Note setting of FREQ. dial.		
		Rotate RF TUNING control clockwise until FREQ. dial setting is 0.04 kc (2-small divisions) higher than previously noted setting. Note indication on multimeter.	+3 to +5 vdc	
		Adjust RF TUNING control to its original position.		
		Rotate RF TUNING control counterclockwise until	-3 to -5 vdc	If all three indications are normal, proceed to step 6.

RESISTANCE IN OHMS	
COMPONENT IN CIRCUIT	COMPONENT OUT OF CIRCUIT
220	220
250	250
150	150
100	100
75K	∞
20K	∞
55K	∞



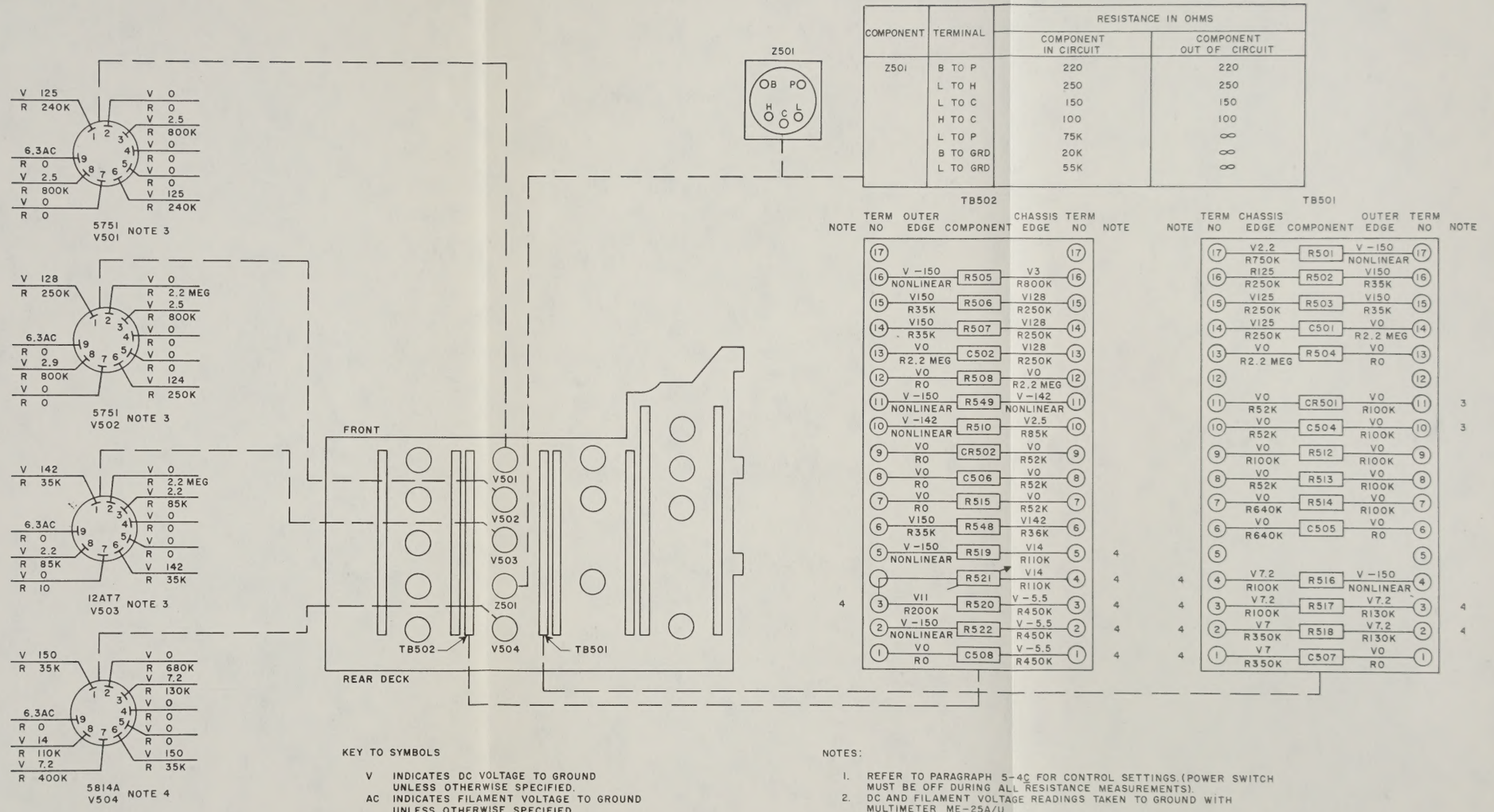
4C FOR CONTROL SETTINGS. (POWER SWITCH
L RESISTANCE MEASUREMENTS).
GE READINGS TAKEN TO GROUND WITH

LEVEL AND FSK SENSE SWITCH TO HOLD.
AGES ON V504 REMOVE V503.

Circuits, Voltage and Resistance Chart

TABLE 5-7. RADIO RECEIVING SET AN/BRR-3, FSK DETECTING CIRCUITS TROUBLE-SHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
3 (cont.)	T	voltage between pin 2 of XV503 and ground using Electronic Multimeter ME-6B/U.		
		Reduce signal generator output of indication on electronic multimeter of 5 vac.		
	S	Measure ac voltage between pin 2 of XV502 and ground using electronic multimeter.	0.25 to 0.50 vac	If indication is abnormal, substitute new 5751 for V502. If trouble persists, perform voltage and resistance check at XV502 (see figure 5-14).
4	U	Replace V503 and its shield. Measure ac voltage between terminal P of Z501 and ground using Electronic Multimeter ME-6B/U.	25 to 50 vac	If indication is abnormal, substitute new 12AT7WA for V503. If trouble persists, perform voltage and resistance check at XV503 (see figure 5-14). If still abnormal, check Z501 (see figure 5-14).
5	S_1	Connect Electronic Multimeter ME-6B/U between pin 2 of XV501 and ground. Adjust signal generator output for indication on electronic multimeter of 5 uv. Adjust RF GAIN MAN control R603 for square pattern on crt indicator V601. Verify that RF TUNING control is adjusted for maximum indication on electronic multimeter.		
	V	Connect Multimeter ME-25A/U for dc measurement between inner terminal 6 on TB501 and ground. Note indication on multimeter.	-1 to +1 vdc	
		Note setting of FREQ. dial.		
		Rotate RF TUNING control clockwise until FREQ. dial setting is 0.04 kc (2-small divisions) higher than previously noted setting. Note indication on multimeter.	+3 to +5 vdc	
		Adjust RF TUNING control to its original position.		
		Rotate RF TUNING control counterclockwise until	-3 to -5 vdc	If all three indications are normal, proceed to step 6.



COMPONENT	TERMINAL	RESISTANCE IN OHMS	
		COMPONENT IN CIRCUIT	COMPONENT OUT OF CIRCUIT
Z501	B TO P	220	220
	L TO H	250	250
	L TO C	150	150
	H TO C	100	100
	L TO P	75K	∞
	B TO GRD	20K	∞
	L TO GRD	55K	∞

TB502

NOTE	TERM NO	OUTER EDGE	COMPONENT	CHASSIS EDGE	TERM NO	NOTE
	17				17	
	16	V −150 NONLINEAR	R505	V3 R800K	16	
	15	V150 R35K	R506	V128 R250K	15	
	14	V150 R35K	R507	V128 R250K	14	
	13	V0 R2.2 MEG	C502	V128 R250K	13	
	12	V0 R0	R508	V0 R2.2 MEG	12	
	11	V −150 NONLINEAR	R549	V −142 NONLINEAR	11	
	10	V −142 NONLINEAR	R510	V2.5 R85K	10	
	9	V0 R0	CR502	V0 R52K	9	
	8	V0 R0	C506	V0 R52K	8	
	7	V0 R0	R515	V0 R52K	7	
	6	V150 R35K	R548	V142 R36K	6	
	5	V −150 NONLINEAR	R519	V14 R110K	5	4
	4		R521	V14 R110K	4	4
4	3	V11 R200K	R520	V −5.5 R450K	3	4
	2	V −150 NONLINEAR	R522	V −5.5 R450K	2	4
	1	V0 R0	C508	V −5.5 R450K	1	4

TB501

NOTE	TERM NO	CHASSIS EDGE	COMPONENT	OUTER EDGE	TERM NO	NOTE
	17	V2.2 R750K	R501	V −150 NONLINEAR	17	
	16	R125 R250K	R502	V150 R35K	16	
	15	V125 R250K	R503	V150 R35K	15	
	14	V125 R250K	C501	V0 R2.2 MEG	14	
	13	V0 R2.2 MEG	R504	V0 R0	13	
	12				12	
	11	V0 R52K	CR501	V0 R100K	11	3
	10	V0 R52K	C504	V0 R100K	10	3
	9	V0 R100K	R512	V0 R100K	9	
	8	V0 R52K	R513	V0 R100K	8	
	7	V0 R640K	R514	V0 R100K	7	
	6	V0 R640K	C505	V0 R0	6	
	5				5	
	4	V7.2 R100K	R516	V −150 NONLINEAR	4	
	3	V7.2 R100K	R517	V7.2 R130K	3	4
	2	V7 R350K	R518	V7.2 R130K	2	4
	1	V7 R350K	C507	V0 R0	1	

KEY TO SYMBOLS

- V INDICATES DC VOLTAGE TO GROUND UNLESS OTHERWISE SPECIFIED.
- AC INDICATES FILAMENT VOLTAGE TO GROUND UNLESS OTHERWISE SPECIFIED.
- R INDICATES DC RESISTANCE.

NOTES:

1. REFER TO PARAGRAPH 5-4C FOR CONTROL SETTINGS (POWER SWITCH MUST BE OFF DURING ALL RESISTANCE MEASUREMENTS).
2. DC AND FILAMENT VOLTAGE READINGS TAKEN TO GROUND WITH MULTIMETER ME-25A/U.
3. SET CRT SWITCH TO SET LEVEL AND FSK SENSE SWITCH TO HOLD.
4. BEFORE MEASURING VOLTAGES ON V504 REMOVE V503.

Figure 5-14. FSK Detecting Circuits, Voltage and Resistance Chart

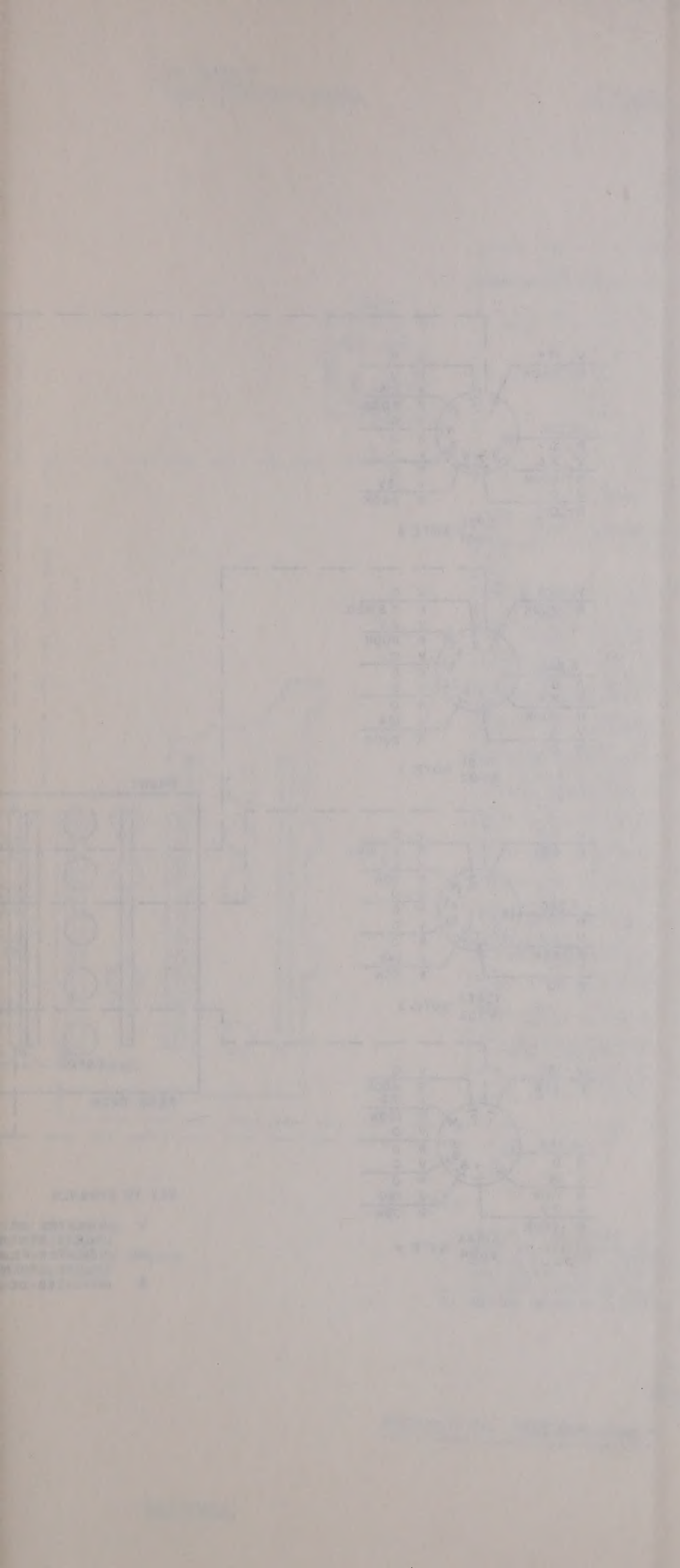


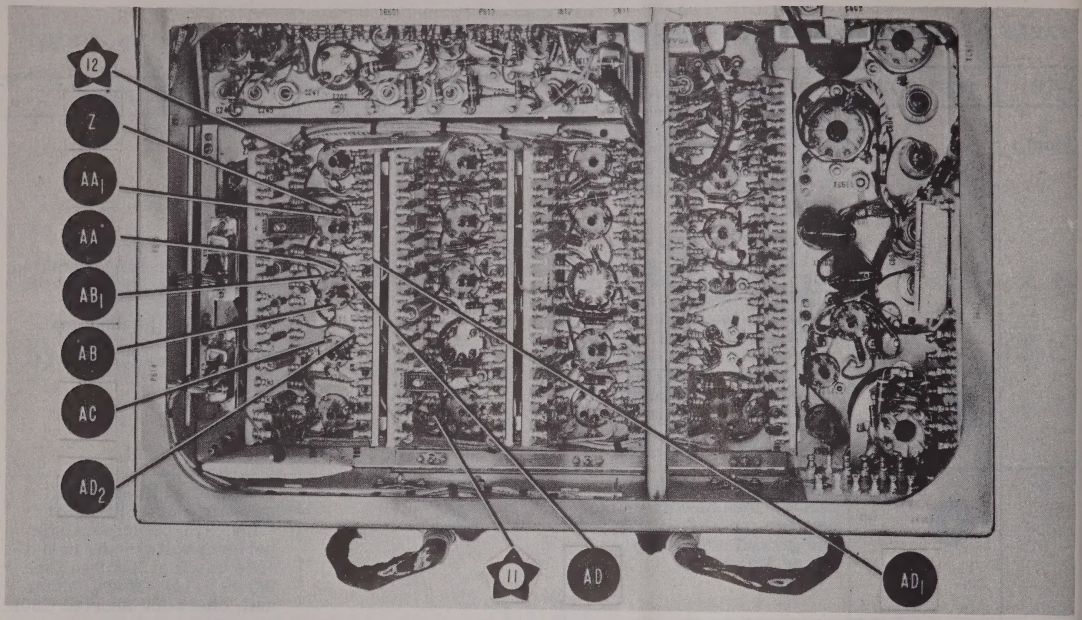
TABLE 5-7. RADIO RECEIVING SET AN/BRR-3, FSK DETECTING CIRCUITS TROUBLE-SHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
5 (cont.)		FREQ. dial setting is 0.04 kc (2-small divisions) lower than original noted setting. Note indication on multimeter.		
	V	Adjust RF TUNING control to its original position. Verify that RF TUNING control is adjusted for maximum indication on Electronic Multimeter ME-6B/U. Connect Multimeter ME-25A/U for dc measurement between inner terminal 7 on TB502 and ground. Note indication on multimeter.	+21 to +26 vdc	If indication is normal, check CR501 and associated circuitry (see figure 5-14). If indication is abnormal, check CR502 and associated circuitry (see figure 5-14).
6	W	Remove V503 and its shield. Measure dc voltage between pin 3 of XV504 and ground using Multimeter ME-25A/U.	+6.5 to +7.5 vdc	If indication is abnormal, substitute new 5814A for V504. If trouble persists, perform voltage and resistance check at XV504A (see figure 5-14). If still abnormal, check for shorted C509.
7	X	Measure dc voltage between pin 8 of XV504 and ground using Multimeter ME-25A/U.	+13 to +15 vdc	If indication is abnormal, substitute new 5841A for V504. If trouble persists, perform voltage and resistance check at XV504B (see figure 5-14).
8	11	Connect Multimeter ME-25A/U for dc measurement between inner terminal 1 on TB502 and ground. Adjust R521 for indication of -5 vdc on multimeter.	Adjustment of R521 should be capable of obtaining an indication of -5 vdc on multimeter	If indication is abnormal, check circuit between test points X and 11

1. TELETYPE KEYER CIRCUITS TROUBLE-SHOOTING CHART. - The procedure used to locate trouble in the teletype keyer circuits is contained in table 5-8. Figures 5-15, 5-16, and 6-38 should be referred to when using this table. In all stage gain measurements, momentarily reduce the signal generator output to zero. This momentary loss of signal ensures recognition that the output indication is the signal voltage and not the noise level.

TABLE 5-8. RADIO RECEIVING SET AN/BRR-3, TELETYPE KEYER CIRCUITS TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	(See figure 5-15.)	Remove R503 and its shield. Connect Multimeter ME-25A/U for dc measurement between inner terminal 1 on TB502 and ground. Adjust R521 for indication of -5 vdc on multimeter.		
	11			
	12	Measure dc voltage between inner terminal 17 on TB504 and ground using multimeter.	+95 to +108 vdc	If indication is abnormal, substitute new 5814A for V505. If trouble persists, perform voltage and resistance check at XV505A (see figure 5-16).



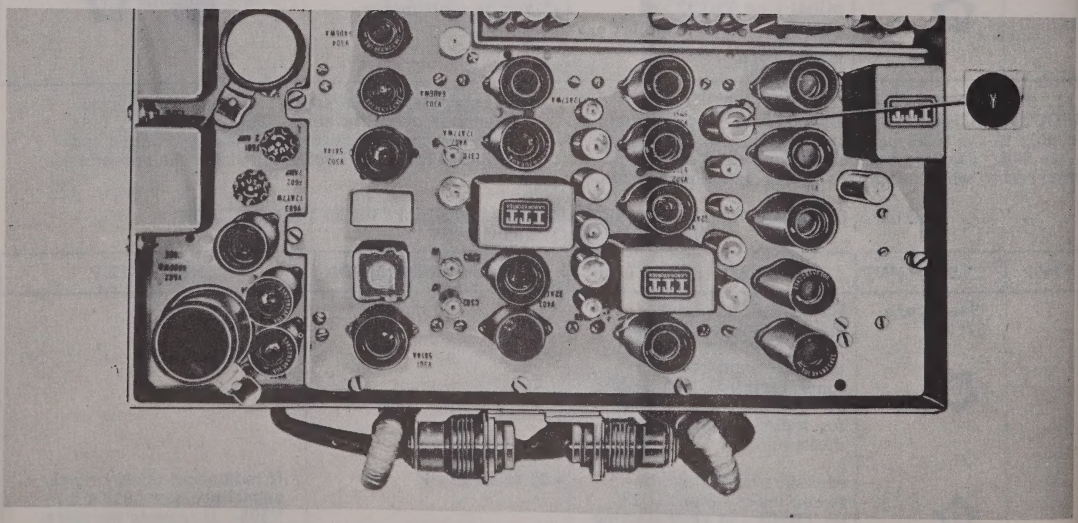


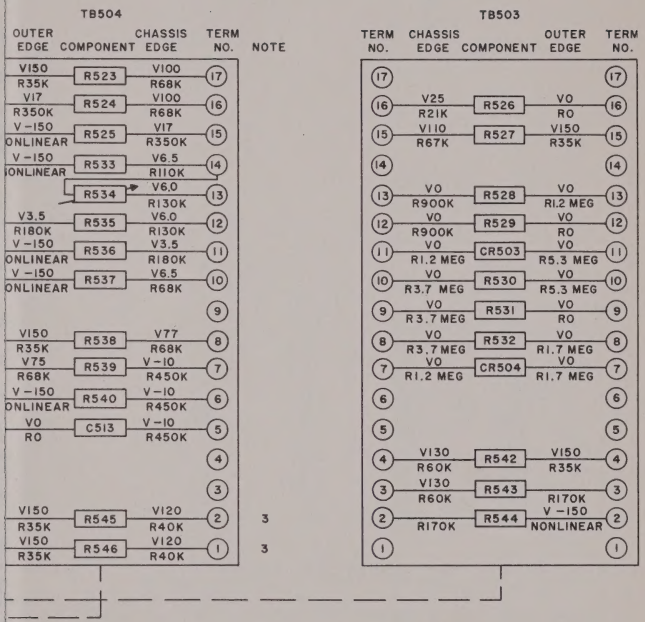
Figure 5-15. Teletype Keyer Circuits, Test Point Locations

TABLE 5-8. RADIO RECEIVING SET AN/BRR-3, TELETYPE KEYER CIRCUITS TROUBLE-SHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
2	Y	Connect Multimeter ME-25A/U for dc measurement between top lead on C510 and ground. Set FSK SENSE switch S603 to NORM. Note indication on multimeter.	+95 to +108 vdc	If indication is abnormal, check circuit between test points 12 and Y
		Set FSK SENSE switch S603 to REV. Note indication on multimeter.	+95 to +108 vdc	If indication is abnormal, substitute new 5814A for V505. If trouble persists, perform voltage and resistance check at XV505B (see figure 5-16). If still abnormal, check circuit between pin 6 of XV505B and test point Y.
3	Z	Measure dc voltage between pin 2 of XV506A and ground using Multimeter ME-25A/U.	Less than +0.1 vdc	If indication is abnormal, set FSK SENSE switch S603 to HOLD. If indication becomes normal, check C510. If indication remains abnormal, substitute new 5814A for V506.
	AA_1	Replace V503 and its shield. Set FSK SENSE switch S603 to HOLD. Measure dc voltage between pin 3 of XV506A and ground using multimeter.	+6.0 to +7.5 vdc	If indication is abnormal, substitute new 5814A for V506. If trouble persists, perform voltage and resistance check at XV506A (see figure 5-16).
	AB	Connect multimeter for dc measurement between pin 7 of XV507B and ground. Adjust R534 for indication of -10 vdc on multimeter.	Indication of -10 vdc can be obtained	If indication is normal, proceed to step 5. If indication is abnormal, proceed to step 4.
4	AA	Connect Multimeter ME-25A/U for dc measurement between pin 2 of XV507A and ground. Adjust R534 for indication of -3.5 vdc on multimeter.	Indication of -3.5 vdc can be obtained	If indication is abnormal, substitute new 5814A for V507. If trouble persists, check circuit between test points AA_1 and AA.
	AB_1	Measure dc voltage between pin 1 of XV507A and ground using multimeter.	+72 to +90 vdc	If indication is normal, check circuit between test points AB_1 and AB.
	AD	Measure dc voltage between pin 3 of XV507A and ground using multimeter.	+6 to +7 vdc	If indication is normal, substitute new 5814A for V507. If trouble persists, perform voltage and resistance check at XV507A (see figure 5-16). If indication is abnormal, substitute new 5814A for V506. If trouble persists, perform voltage and resistance check at XV506B (see figure 5-16).

TABLE 5-8. RADIO RECEIVING SET AN/BRR-3, TELETYPE KEYER CIRCUITS TROUBLE-SHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
5	AC	Remove V508, V509, and their shields. Measure dc voltage between pin 1 of XV508 and ground using Multimeter ME-25A/U.	+12 to +25 vdc	If indication is normal, substitute new 6005/6AQ5W for V508 and V509. If trouble persists, perform voltage and resistance check at XV508 and XV509 (see figure 5-16).
		Replace V508, V509, and their shields.		If indication is abnormal, substitute new 5814A for V507. If trouble persists, perform voltage and resistance check at XV507B (see figure 5-16).
6	V	Adjust RF GAIN MAN control R603 to 0. Set FSK SENSE switch S603 to NORM. Connect Adapter UG-514/U to Audio Oscillator TS-832A/U. Connect output of adapter between pin 2 of XV504A and ground. Adjust audio oscillator for 23 cps operation.		
	11	Connect Electronic Multimeter ME-6B/U between pin 2 of XV505A and ground. Adjust audio oscillator output for indication on electronic multimeter of 0.25 vac.		
	12	Measure voltage between inner terminal 17 on TB504 and ground using electronic multimeter.	3 to 5 vac	If indication is abnormal, substitute new 5814A for V505. If trouble persists, perform voltage and resistance check at XV505A (see figure 5-16).
	Y	Connect electronic multimeter between top lead on C510 and ground. Note indication on electronic multimeter.	2.5 to 5.0 vac	If indication is abnormal, check circuit between test points 12 and Y
		Set FSK SENSE switch S603 to REV. Note indication on electronic multimeter.	2.5 to 5.0 vac	If indication is abnormal, substitute new 5814A for V505. If trouble persists, perform voltage and resistance check at XV505B (see figure 5-16). If still abnormal, check circuit between pin 6 of XV505B and test point Y.
7	AA1	Measure voltage between pin 3 of XV506A and ground using Electronic Multimeter ME-6B/U.	1.5 to 3.0 vac	If indication is abnormal, substitute new 5814A for V506. If trouble persists, perform voltage and resistance check at XV506A (see figure 5-16). If still abnormal, check circuits between test points Y and Z.



R TO PARAGRAPH 5-4C FOR CONTROL SETTINGS. (POWER
H MUST BE OFF DURING ALL RESISTANCE MEASUREMENTS).
ND FILAMENT VOLTAGE READINGS TAKEN TO GROUND WITH
METER ME-25A/U.
PRINTER CONNECTED TO RECEIVER.
SK SENSE SWITCH TO HOLD POSITION.
E MEASURING VOLTAGES ON V505 REMOVE V503. REPLACE
AFTER TEST.
VARY WITH TELETYPE POWER SUPPLY.

r Circuits, Voltage and Resistance Chart

TABLE 5-8. RADIO RECEIVING SET AN/BRR-3, TELETYPE KEYER CIRCUITS TROUBLE-SHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
5	AC	Remove V508, V509, and their shields. Measure dc voltage between pin 1 of XV508 and ground using Multimeter ME-25A/U.	+12 to +25 vdc	If indication is normal, substitute new 6005/6AQ5W for V508 and V509. If trouble persists, perform voltage and resistance check at XV508 and XV509 (see figure 5-16).
		Replace V508, V509, and their shields.		If indication is abnormal, substitute new 5814A for V507. If trouble persists, perform voltage and resistance check at XV507B (see figure 5-16).
6	V	Adjust RF GAIN MAN control R603 to 0. Set FSK SENSE switch S603 to NORM. Connect Adapter UG-514/U to Audio Oscillator TS-832A/U. Connect output of adapter between pin 2 of XV504A and ground. Adjust audio oscillator for 23 cps operation.		
	11	Connect Electronic Multimeter ME-6B/U between pin 2 of XV505A and ground. Adjust audio oscillator output for indication on electronic multimeter of 0.25 vac.		
	12	Measure voltage between inner terminal 17 on TB504 and ground using electronic multimeter.	3 to 5 vac	If indication is abnormal, substitute new 5814A for V505. If trouble persists, perform voltage and resistance check at XV505A (see figure 5-16).
	Y	Connect electronic multimeter between top lead on C510 and ground. Note indication on electronic multimeter.	2.5 to 5.0 vac	If indication is abnormal, check circuit between test points 12 and Y
		Set FSK SENSE switch S603 to REV. Note indication on electronic multimeter.	2.5 to 5.0 vac	If indication is abnormal, substitute new 5814A for V505. If trouble persists, perform voltage and resistance check at XV505B (see figure 5-16). If still abnormal, check circuit between pin 6 of XV505B and test point Y.
7	AA1	Measure voltage between pin 3 of XV506A and ground using Electronic Multimeter ME-6B/U.	1.5 to 3.0 vac	If indication is abnormal, substitute new 5814A for V506. If trouble persists, perform voltage and resistance check at XV506A (see figure 5-16). If still abnormal, check circuits between test points Y and Z.

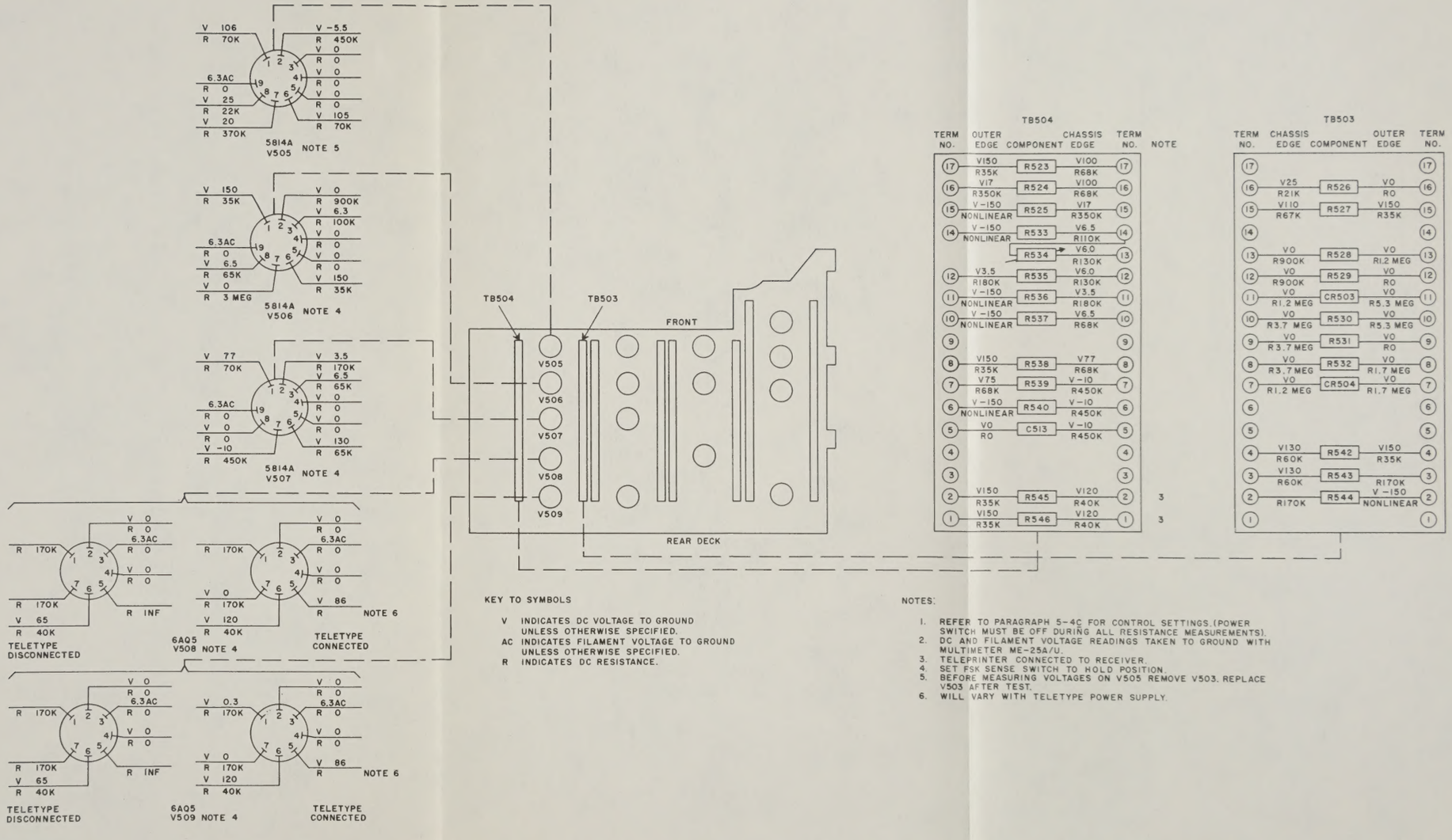


Figure 5-16. Teletype Keyer Circuits, Voltage and Resistance Chart

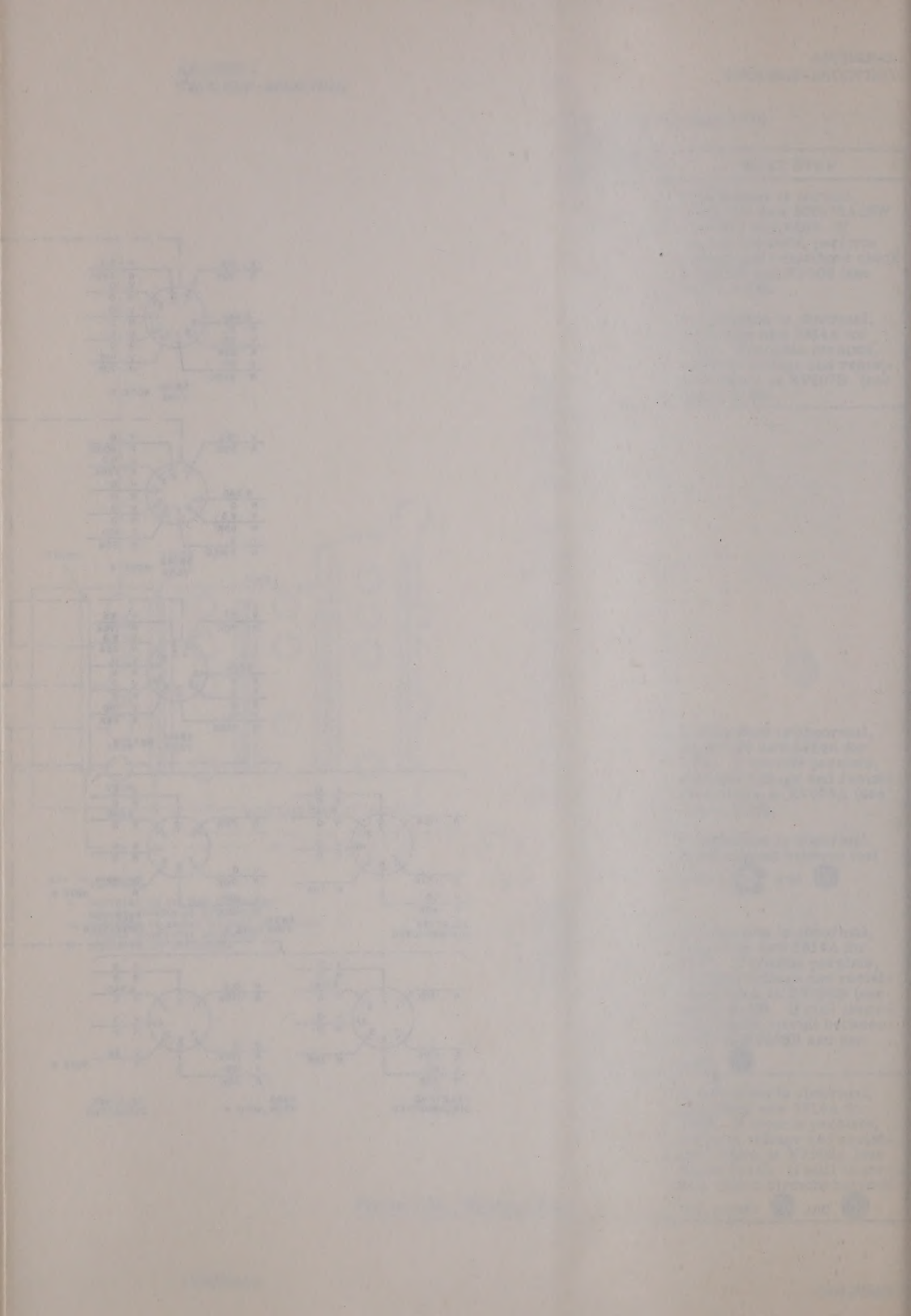


TABLE 5-8. RADIO RECEIVING SET AN/BRR-3, TELETYPE KEYER CIRCUITS TROUBLE-SHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
8	AB_1	Measure voltage between pin 1 of XV507A and ground using Electronic Multimeter ME-6B/U.	15 to 25 vac	If indication is abnormal, substitute new 5814A for V507 and V506. If trouble persists, perform voltage and resistance check at XV507A and XV506B (see figure 5-16).
9	AD_1	Measure dc voltage between outer terminal 11 on TB503 and ground using Multimeter ME-25A/U.	+2.5 to +4.0 vdc	If indication is abnormal, check CR503 and associated circuitry.
	AD_2	Measure dc voltage between outer terminal 7 on TB503 and ground using multimeter.	-2.5 to -4.0 vdc	If indication is abnormal, check CR504 and associated circuitry.
10	AB_1	Connect Electronic Multimeter ME-6B/U between pin 1 of XV507A and ground. Reduce output of Audio Oscillator TS-382A/U for indication on electronic multimeter of 5 vac.		
	AB	Measure voltage between pin 7 of XV507B and ground using electronic multimeter.	1.2 to 2.5 vac	If indication is abnormal, check circuit between test points AB_1 and AB

m. GAIN CONTROL CIRCUITS TROUBLE-SHOOTING CHART. - The procedure used to locate trouble in the gain control circuits is contained in table 5-9. Figures 5-2, 5-17, 5-18, and 6-39 should be referred to when using this table. In all stage gain measurements, momentarily reduce the signal generator output to zero. This momentary loss of signal ensures recognition that the output indication is the signal voltage and not the noise level.

TABLE 5-9. RADIO RECEIVING SET AN/BRR-3, GAIN CONTROL CIRCUITS TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	1 (See figure 5-2.)	Verify that AGC-MAN control S604 is set to MAN. Connect RF Signal Generator Set AN/URM-25D to 50 OHM ANTENNA connector J603. Adjust signal generator for 5 uv output at 14 kc.		
	8 (See figure 5-17 for this and all succeeding test points.)	Connect Electronic Multimeter ME-6B/U between inner terminal 3 on TB302 and ground. Adjust RF TUNING control for maximum indication on electronic multimeter; simultaneously adjust RF GAIN MAN control R603 for indication on electronic multimeter of 0.4 vac.		

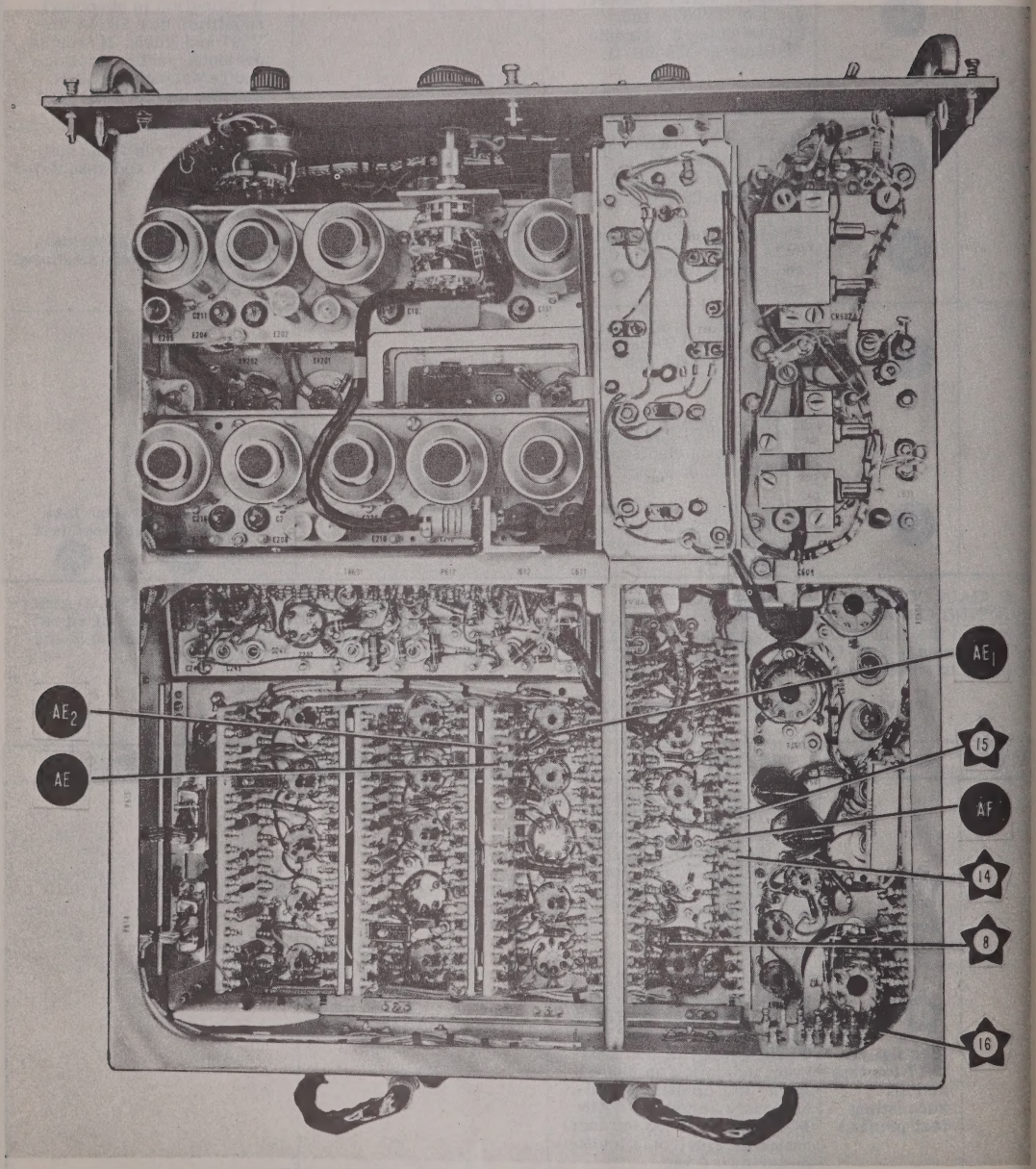
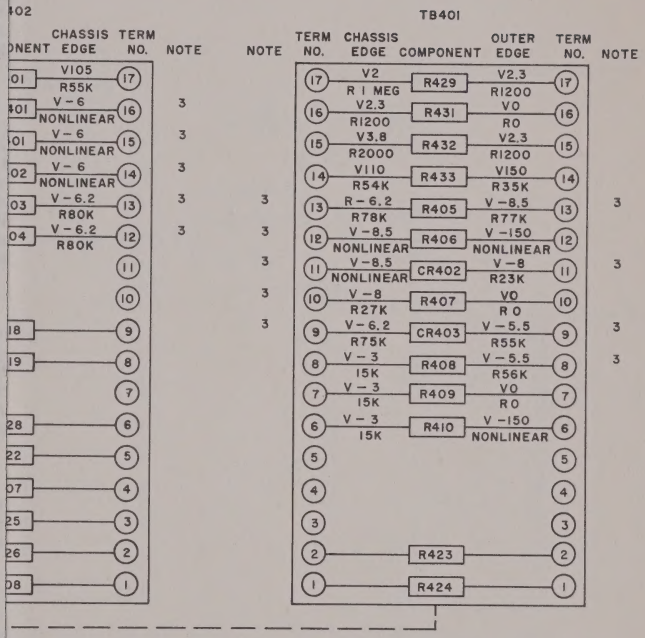


Figure 5-17. Gain Control Circuits, Test Point Locations

Figure
5-18



PH 5-4C FOR CONTROL SETTINGS (POWER SWITCH
ALL RESISTANCE MEASUREMENTS).
OLTAGE READINGS TAKEN TO GROUND WITH
A/U.
TO PRODUCE -8 VDC AT OUTER TERMINAL 11 OF TB401.

trol Circuits, Voltage and Resistance Chart

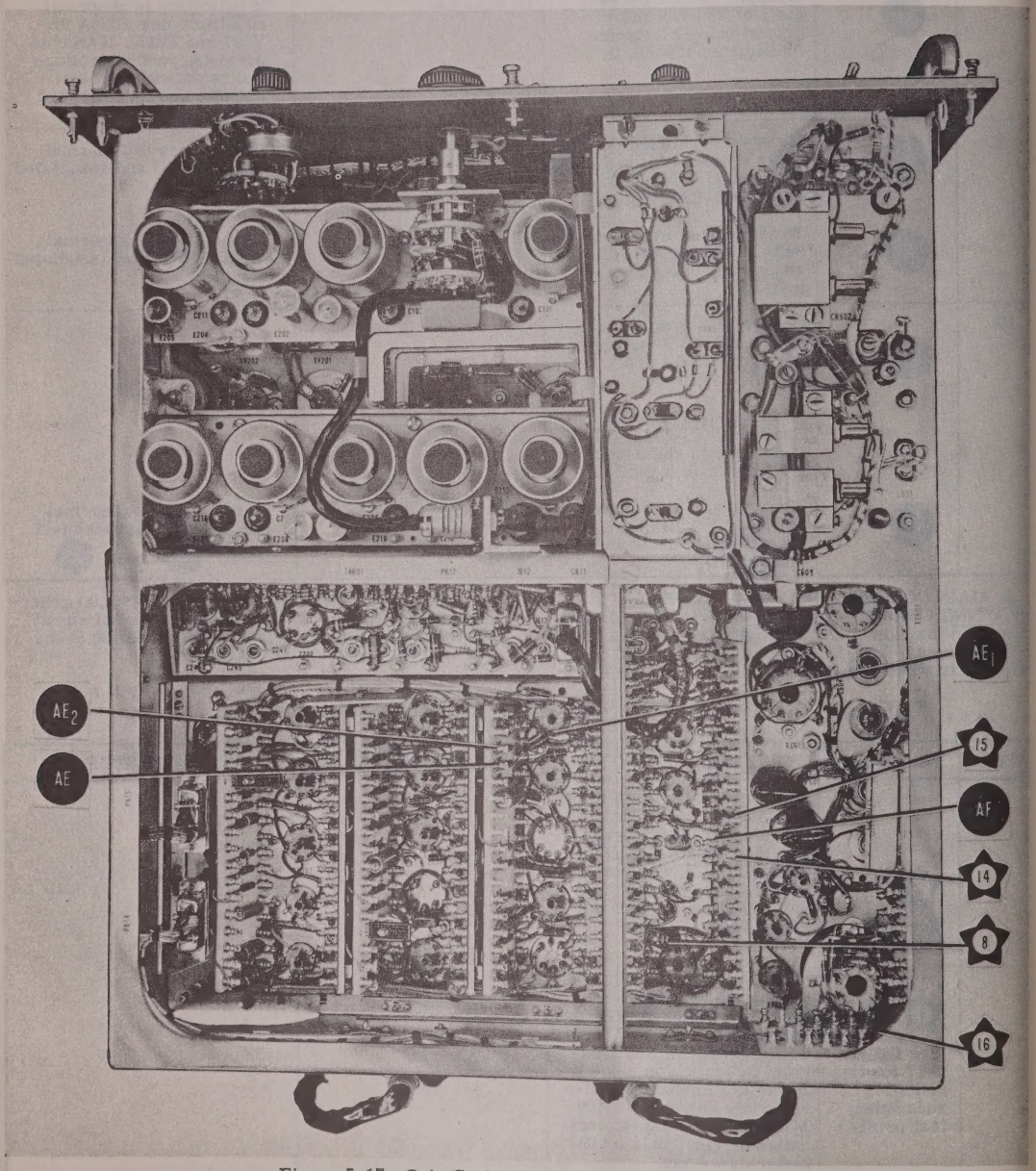
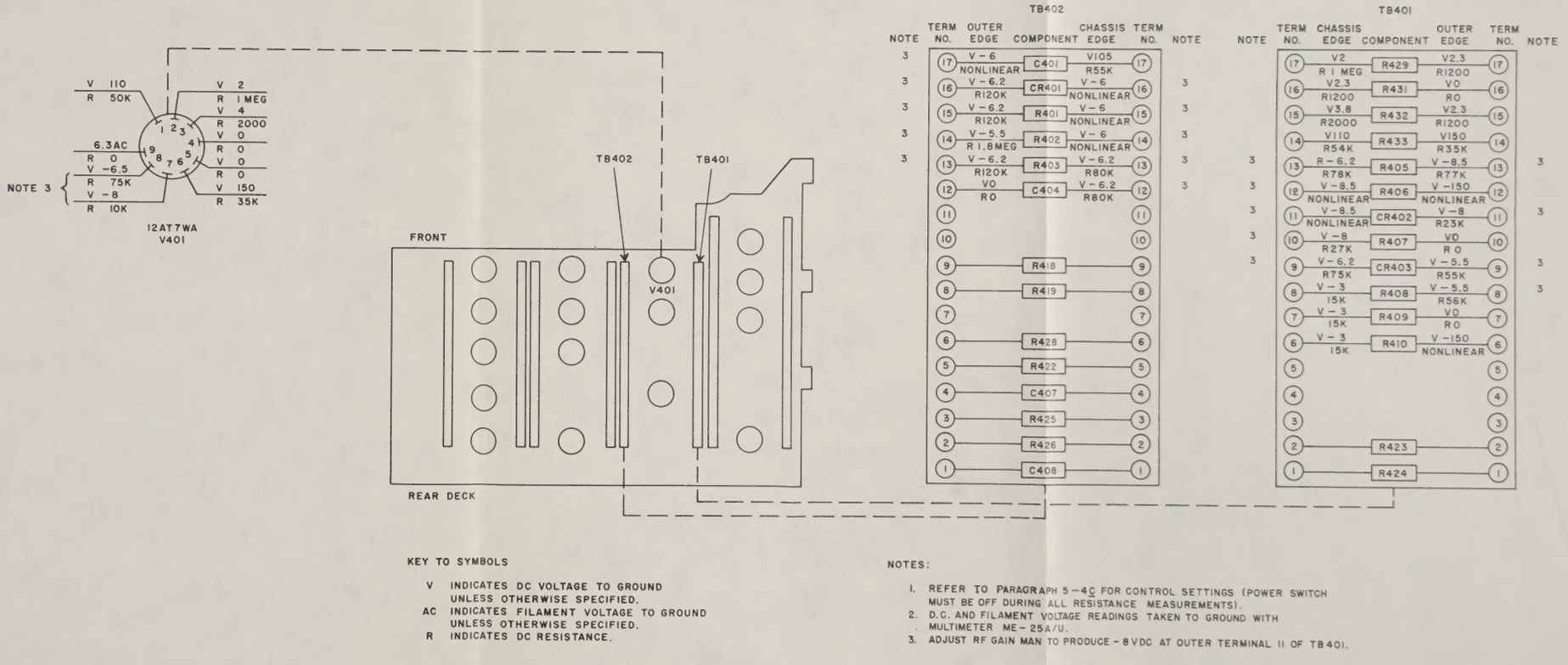


Figure 5-17. Gain Control Circuits, Test Point Locations



KEY TO SYMBOLS

V INDICATES DC VOLTAGE TO GROUND UNLESS OTHERWISE SPECIFIED.
AC INDICATES FILAMENT VOLTAGE TO GROUND UNLESS OTHERWISE SPECIFIED.
R INDICATES DC RESISTANCE.

NOTES:

1. REFER TO PARAGRAPH 5-4C FOR CONTROL SETTINGS (POWER SWITCH MUST BE OFF DURING ALL RESISTANCE MEASUREMENTS).
2. D.C. AND FILAMENT VOLTAGE READINGS TAKEN TO GROUND WITH MULTIMETER ME-25A/U.
3. ADJUST RF GAIN MAN TO PRODUCE -8 VDC AT OUTER TERMINAL 11 OF TB401.

Figure 5-18. Gain Control Circuits, Voltage and Resistance Chart

TABLE 5-9. RADIO RECEIVING SET AN/BRR-3, GAIN CONTROL CIRCUITS TROUBLE-SHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1 (cont.)	16	Measure voltage between terminal 1 on TB602 and ground using electronic multimeter.	2 to 4 vac	If indication is abnormal, substitute new 12AT7WA for V401. If trouble persists, perform voltage and resistance check at XV401A (see figure 5-18).
2	AE_2 AE	Temporarily connect a clip lead between outer terminal 15 on TB402 and ground. Measure dc voltage between outer terminal 14 on TB402 and ground using Multimeter ME-25A/U. Remove clip lead.	-2 to -3 vdc	If indication is abnormal, check CR401 and associated circuitry.
3	AE_1	Remove V401 and its shield. Set RF GAIN MAN control R603 to 10. Connect Multimeter ME-25A/U for dc measurement between pin 7 of XV401B and ground. Note indication on multimeter.	-0.5 to -1.5 vdc	
		Set RF GAIN MAN control R603 to 0. Note indication on multimeter.	-18 to -25 vdc	If either indication is abnormal, check R603 and associated circuitry.
4	AE_1	Replace V401 and its shield. Measure dc voltage between pin 7 of XV401B and ground using Multimeter ME-25A/U.	-18 to -25 vdc	If indication is abnormal, substitute new 12AT7WA for V401.
	AF	Measure dc voltage between inner terminal 9 on TB401 and ground using multimeter.	-17 to -21 vdc	If indication is abnormal, substitute new 12AT7WA for V401. If trouble persists, perform voltage and resistance check at XV401B (see figure 5-18).
	15	Measure dc voltage between outer terminal 11 on TB401 and ground using multimeter.	-18 to -22 vdc	If indication is abnormal, check CR402 and associated circuitry.
	14	Connect multimeter for dc measurement between outer terminal 9 on TB401 and ground. Note indication on multimeter.	-17 to -21 vdc	
		Slowly rotate RF GAIN MAN control R603 from 0 to 10 while observing indication on multimeter.	Voltage should change smoothly from between -17 to -21 vdc to between -2.0 and -2.5 vdc and remain there	If either indication is abnormal, check CR403 and associated circuitry.
5		Set AGC-MAN switch S604 to AGC. Observe pattern on crt indicator V601.	After approximately a 3-second delay, square pattern should appear	If indication is abnormal, check C403 and then check C402.

n. CRT CIRCUITS TROUBLE-SHOOTING CHART. - The procedure used to locate a trouble in the CRT circuits is contained in table 5-10. Figures 5-2, 5-19, 5-20, and 6-40 should be referred to when using this table. In all stage gain measurements, momentarily reduce the signal generator output to zero. This momentary loss of signal ensures recognition that the output indication is the signal voltage and not the noise level.

TABLE 5-10. RADIO RECEIVING SET AN/BRR-3, CRT CIRCUITS TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1		Verify that CRT switch S605 is set to SET LEVEL and that AGC-MAN switch S604 is set to MAN. Adjust RF GAIN MAN control R603 to 0. Observe face of crt indicator V601.	Horizontal trace approximately at horizontal center of crt indicator	If no trace is present, perform voltage check at TB601 (see figure 5-20). If trouble persists, substitute new 2BP1 for V601 (see Section 6, paragraph 6-7b). If trace is not at approximate center, perform voltage check at terminals 20 and 23 of TB601 (see figure 5-20). If trouble persists, substitute new 2BP1 for V601 (see Section 6, paragraph 6-7b).
2	 (See figure 5-2.)	Connect RF Signal Generator Set AN/URM-25D to 50 OHM ANTENNA connector J603. Adjust signal generator for 5 uv output at 14 kc.		
	 (See figure 5-19 for this and all succeeding test points.)	Connect Electronic Multimeter ME-6B/U between terminal 1 on TB602 and ground. Adjust RF TUNING control for maximum indication on electronic multimeter; simultaneously adjust RF GAIN MAN control R603 for an indication of 3 vac.		
		Measure voltage between pin 6 of XV603B and ground using electronic multimeter.	6 to 12 vac	If indication is abnormal, substitute new 12AT7WA for V603. If trouble persists, perform voltage and resistance check at XV603B (see figure 5-20). If still abnormal, check grid circuit of V603B.
		Measure voltage between terminal 16 on TB601 and ground using electronic multimeter.	6 to 12 vac	If indication is abnormal, check S605 and C613.
3		Set CRT switch S605 to FSK TUNE. Rock RF TUNING control ±0.05 kc.	Position of horizontal trace should vary vertically	If indication is abnormal, check S605.

o. POWER SUPPLY CIRCUITS TROUBLE-SHOOTING CHART. - The procedure used to locate trouble in the power supply circuit is contained in table 5-11. Figures 5-21, 5-22, 5-23, and 6-41 should be referred to when using this table.

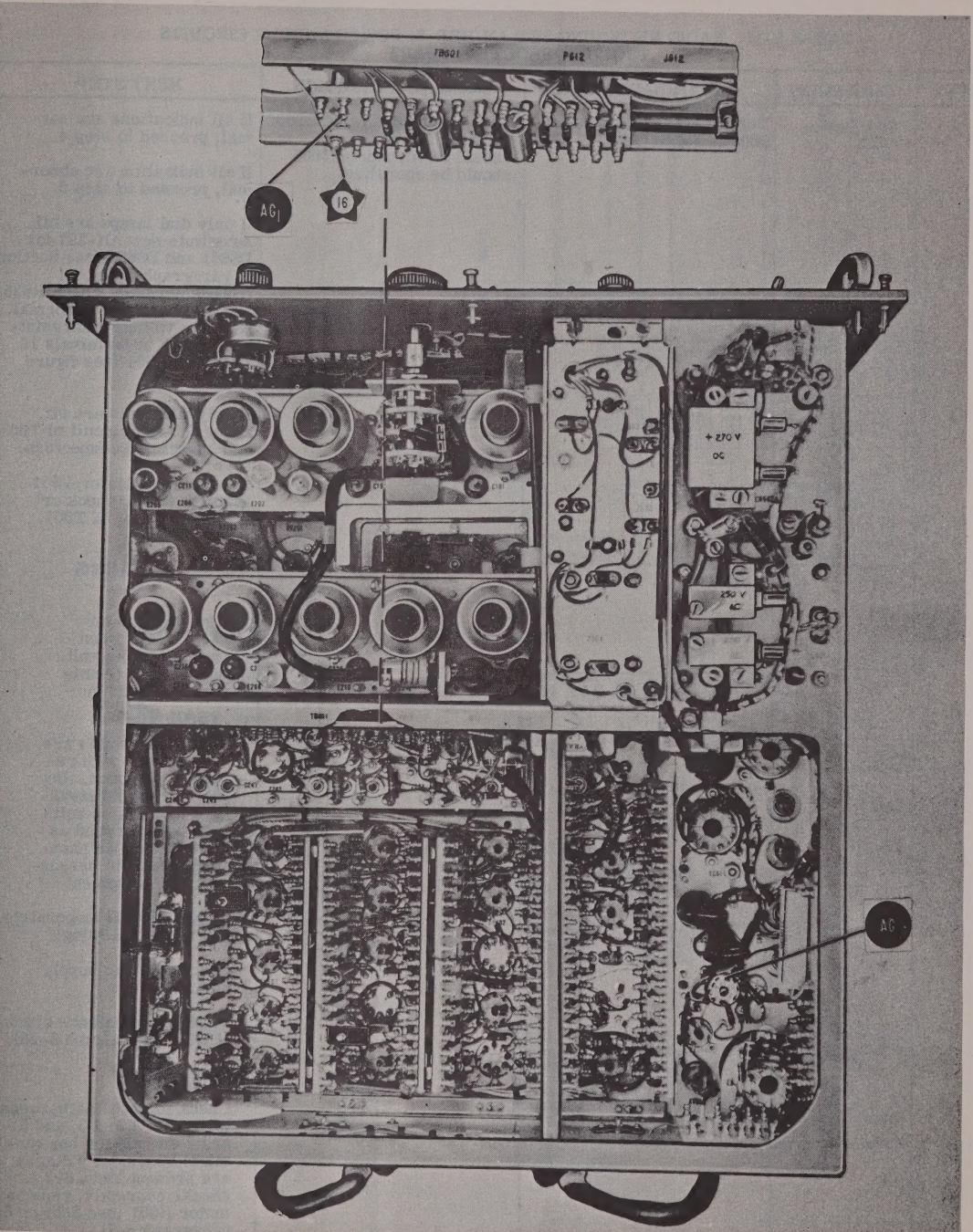
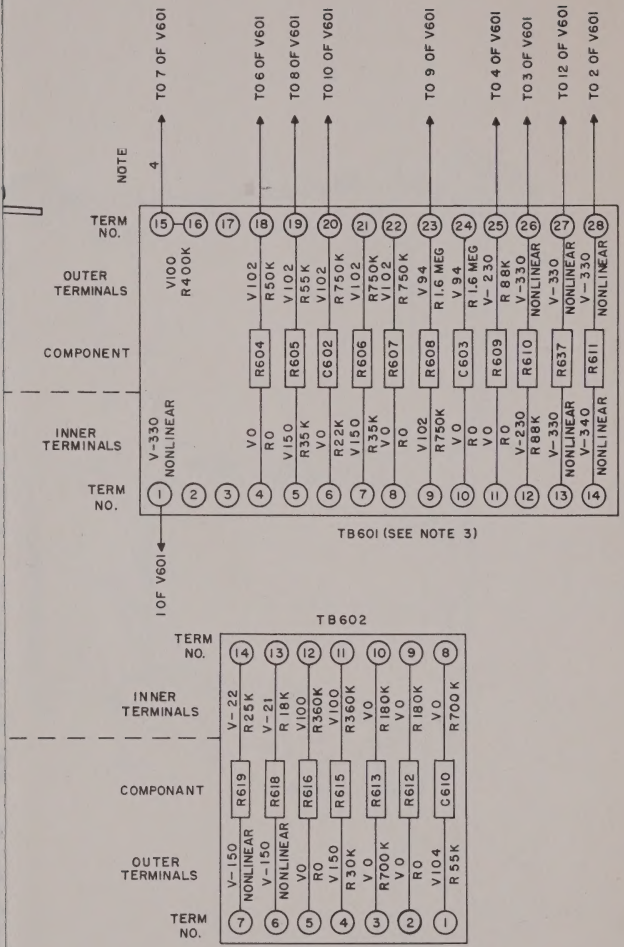


Figure 5-19. CRT Circuits, Test Point Locations

TABLE 5-11. RADIO RECEIVING SET AN/BRR-3, POWER SUPPLY CIRCUITS TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	(See figure 5-21.)	Verify that POWER switch S606 is set to ON.	Dial lamps DS601 and DS602 and tube filaments should be lit; motor B601 should be operating	If all indications are normal, proceed to step 4. If all indication are abnormal, proceed to step 2. If only dial lamps are off, substitute new AN-327 for DS601 and DS602 (see Section 6, paragraph 6-7e). If trouble persists, check R635 and R636. If still abnormal, perform voltage and resistance check at terminals 10 and 11 of T601 (see figure 5-22). If only filaments are off, check 6.3 vac circuit of T601 and associated connectors. If only crt indicator V601 filament is off, check crt filament circuit of T601. **WARNING** Use Multimeter AN/PSM-4 when measuring ac voltage across terminals 1 and 26 on TB601 (20). These terminals are at -340 vdc with respect to ground. Do not attempt to measure this heater voltage using ground as a reference as harm may result to personnel and equipment. If motor B601 is inoperative, perform the following: Check B601 ac supply circuit. Perform resistance check at B601 (see figure 5-22). Check C612. Check for 115 vac between terminals 1 and 3, and 3 and 4 on junction box terminal board. If voltages are present and C612 checks correctly, replace motor B601 (see Section 6, paragraph 6-7j).

Figure 5-20

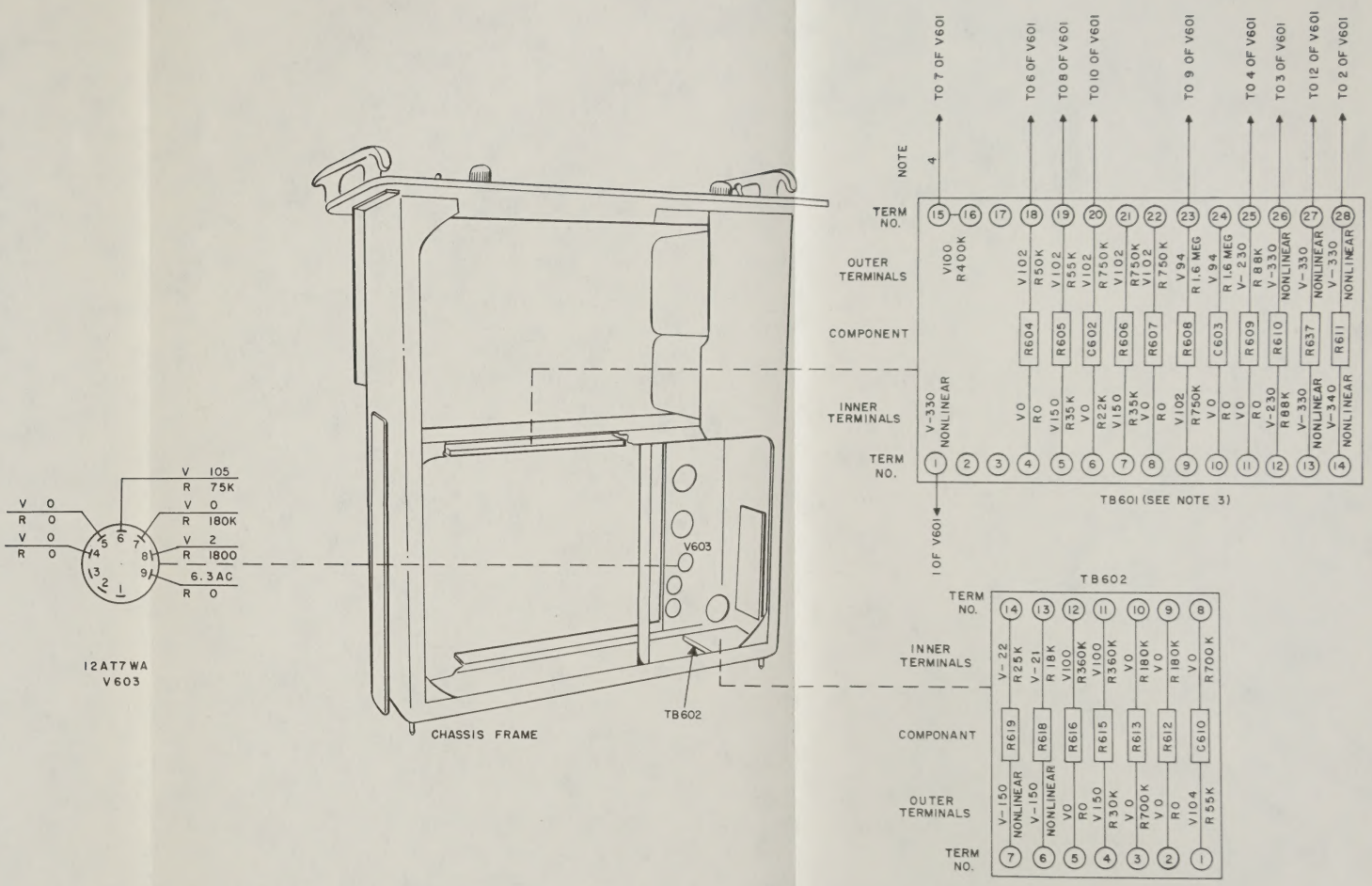


NOTES:

1. REFER TO PARAGRAPH 5-4C FOR CONTROL SETTINGS (POWER SWITCH MUST BE OFF DURING ALL RESISTANCE MEASUREMENTS).
2. DC AND FILAMENT VOLTAGE READINGS TAKEN TO GROUND WITH MULTIMETER ME-25 A/U.
3. FOR MEASUREMENTS ON TB601 CHASSIS FRAME MUST BE ROTATED 180° FROM POSITION SHOWN IN THIS FIGURE. TERMINAL BOARD DRAWING IS AS SEEN AS CHASSIS FRAME IS SO ROTATED.
4. VALUE CHANGES WITH SETTING OF CRT SWITCH (CRT SWITCH TO SET LEVEL)

TABLE 5-11. RADIO RECEIVING SET AN/BRR-3, POWER SUPPLY CIRCUITS TROUBLE-SHOOTING CHART

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
1	(See figure 5-21.)	Verify that POWER switch S606 is set to ON.	Dial lamps DS601 and DS602 and tube filaments should be lit; motor B601 should be operating	If all indications are normal, proceed to step 4. If all indication are abnormal, proceed to step 2. If only dial lamps are off, substitute new AN-327 for DS601 and DS602 (see Section 6, paragraph 6-7e). If trouble persists, check R635 and R636. If still abnormal, perform voltage and resistance check at terminals 10 and 11 of T601 (see figure 5-22). If only filaments are off, check 6.3 vac circuit of T601 and associated connectors. If only crt indicator V601 filament is off, check crt filament circuit of T601. **WARNING** Use Multimeter AN/PSM-4 when measuring ac voltage across terminals 1 and 26 on TB601 (20). These terminals are at -340 vdc with respect to ground. Do not attempt to measure this heater voltage using ground as a reference as harm may result to personnel and equipment. If motor B601 is inoperative, perform the following: Check B601 ac supply circuit. Perform resistance check at B601 (see figure 5-22). Check C612. Check for 115 vac between terminals 1 and 3, and 3 and 4 on junction box terminal board. If voltages are present and C612 checks correctly, replace motor B601 (see Section 6, paragraph 6-7j).



KEY TO SYMBOLS

V	INDICATES DC VOLTAGE TO GROUND UNLESS OTHERWISE SPECIFIED
AC	INDICATES FILAMENT VOLTAGE TO GROUND UNLESS OTHERWISE SPECIFIED
R	INDICATES DC RESISTANCE

NOTES:

1. REFER TO PARAGRAPH 5-4C FOR CONTROL SETTINGS (POWER SWITCH MUST BE OFF DURING ALL RESISTANCE MEASUREMENTS).
2. DC AND FILAMENT VOLTAGE READINGS TAKEN TO GROUND WITH MULTIMETER ME-25 A/U.
3. FOR MEASUREMENTS ON TB601 CHASSIS FRAME MUST BE ROTATED 180° FROM POSITION SHOWN IN THIS FIGURE. TERMINAL BOARD DRAWING IS AS SEEN AS CHASSIS FRAME IS SO ROTATED.
4. VALUE CHANGES WITH SETTING OF CRT SWITCH (CRT SWITCH TO SET LEVEL)

Figure 5-20. CRT Circuits, Voltage and Resistance Chart

TABLE 5-11. RADIO RECEIVING SET AN/BRR-3, POWER SUPPLY CIRCUITS TROUBLE-SHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
2		Visually check fuses F601 and F602 and replace if necessary. NOTE Slow-blow fuses must be used.	Fuses should not be blown	If fuses are not blown, check primary circuit for 115 vac (see figure 5-23). If fuses continue to blow, set POWER switch S606 to OFF, and proceed to step 3.
3	AH	Verify that POWER switch S606 is OFF. Using Multimeter AN/PSM-4 on R x 1 scale, measure resistance between heat sink of CR601 and CR602 and ground. Note indication on multimeter. Reverse multimeter leads and remeasure resistance. Note indication on multimeter. NOTE Do not use a vacuum tube type multimeter for any resistance measurements made in this table. Erroneous measurements may result.	One indication should be infinity on this scale; the other indication should be approximately 100 ohms on this scale.	If both indications are 0 ohms, check C604 for short. If both indications are approximately 20 ohms, check CR601 and CR602 for short. If lower indication is approximately 50 ohms and higher indication is approximately 120 ohms, check C605A and associated circuitry for short.
	AH	Using the same test lead arrangement that resulted in the higher resistance indication, set multimeter to R x 10,000 scale and measure resistance between heat sink of CR601 and CR602 and ground.	Greater than 300,000 ohms on this scale	If indication is normal, check T601 (see figure 5-22). If indication is abnormal, check CR601 and CR602.
	23	Measure resistance between terminal 10 on TB603 and ground.	Greater than 5,000 ohms	If indication is abnormal, check +150 vdc bus for short.
	AI	Set multimeter to R x 1 scale and measure resistance between tip of CR603 and ground. Note indication on multimeter. Reverse multimeter leads and remeasure resistance. Note indication on multimeter. Remove V605 and its shield.	One indication should be infinity on this scale; the other indication should be approximately 100 ohms on this scale.	If both indications are 0 ohms, check C607 for short. If both indications are 20 ohms, check CR603 and CR604 for short.
	AI	Using same test lead arrangement that resulted in higher resistance indication, set multimeter to R x 10,000 scale and measure resistance between tip of CR603 and ground.	Greater than 100,000 ohms on this scale	If indication is approximately 2,500 ohms, check C608 for short.

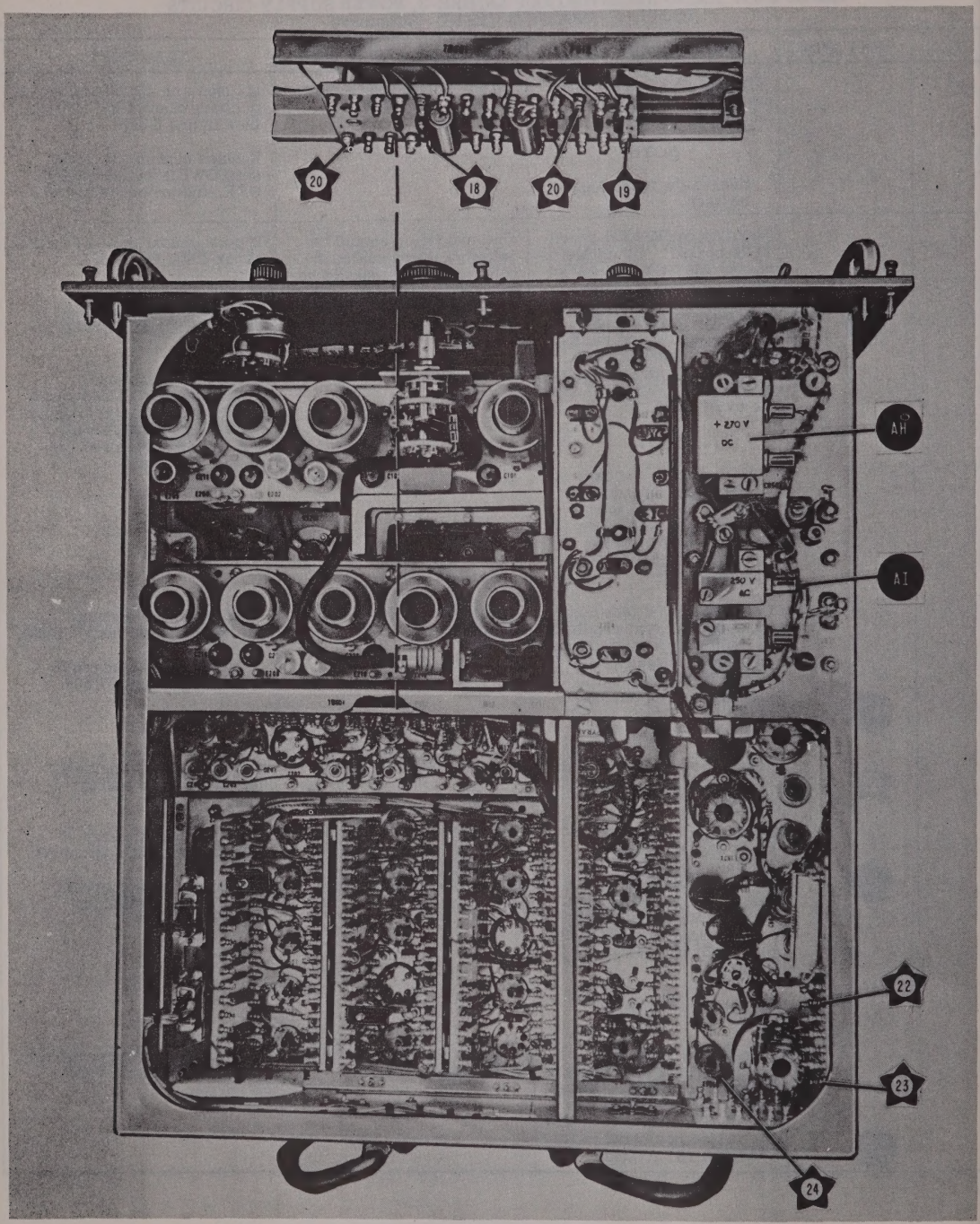
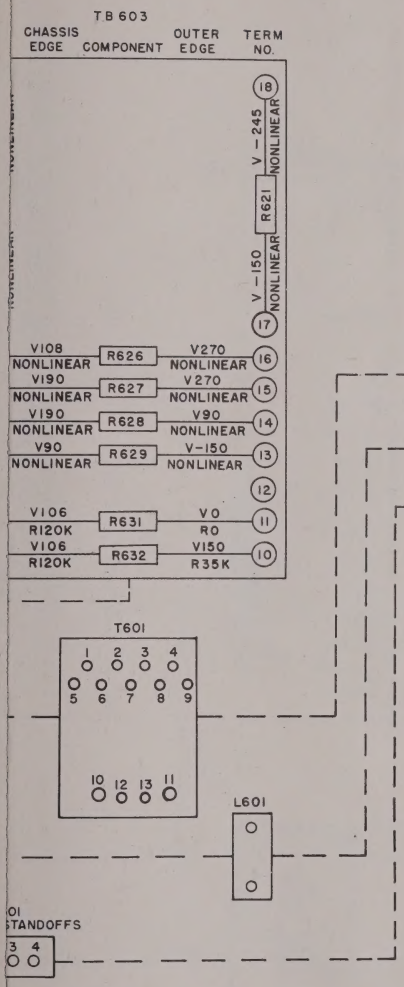


Figure 5-21. Power Supply Circuits, Test Point Locations



COMPONENT	TERMINAL	AC VOLTAGE	RESISTANCE IN OHMS	
			COMPONENT IN CIRCUIT	COMPONENT OUT OF CIRCUIT
T601	12 TO 13	6.3(NOTE 3)	0	0.1
	1 TO 4	125	1.2	1.2
	1 TO 3	115	1.1	1.1
	1 TO 2	105	1.0	1.0
	1 TO GRD	—	∞	∞
	10 TO 11	6.3	0	0
	7 TO 5	250	17	17
	7 TO 9	250	17	17
	7 TO GRD	0	0	∞
	11 TO GRD	0	0	∞
	12 TO GRD	(NOTE 4)	50K	∞
L601	PIN TO PIN	—	120	120
B601 TERMINAL STANDOFFS	1 TO 2	115	1.6	400
	3 TO 4	115	400	400
	2 TO 3	0	0	0
	1 TO 4	—	400	∞

KEY TO SYMBOLS

V	INDICATES DC VOLTAGE TO GROUND UNLESS OTHERWISE SPECIFIED
AC	INDICATES FILAMENT VOLTAGE TO GROUND UNLESS OTHERWISE SPECIFIED
R	INDICATES DC RESISTANCE

NOTES:

1. REFER TO PARAGRAPH 5-4C FOR CONTROL SETTINGS. (POWER SWITCH MUST BE OFF DURING ALL RESISTANCE MEASUREMENTS).
2. DC AND FILAMENT VOLTAGE READING TAKEN TO GROUND WITH MULTIMETER ME-25A/U, UNLESS OTHERWISE SPECIFIED.
3. MULTIMETER AN/PSM-4 MUST BE USED FOR THIS MEASUREMENT.
4. THIS TERMINAL IS AT -340VDC WITH RESPECT TO GROUND. DO NOT ATTEMPT TO MEASURE THIS VOLTAGE.

Figure 5-22. Power Supply Circuits, Voltage and Resistance Chart

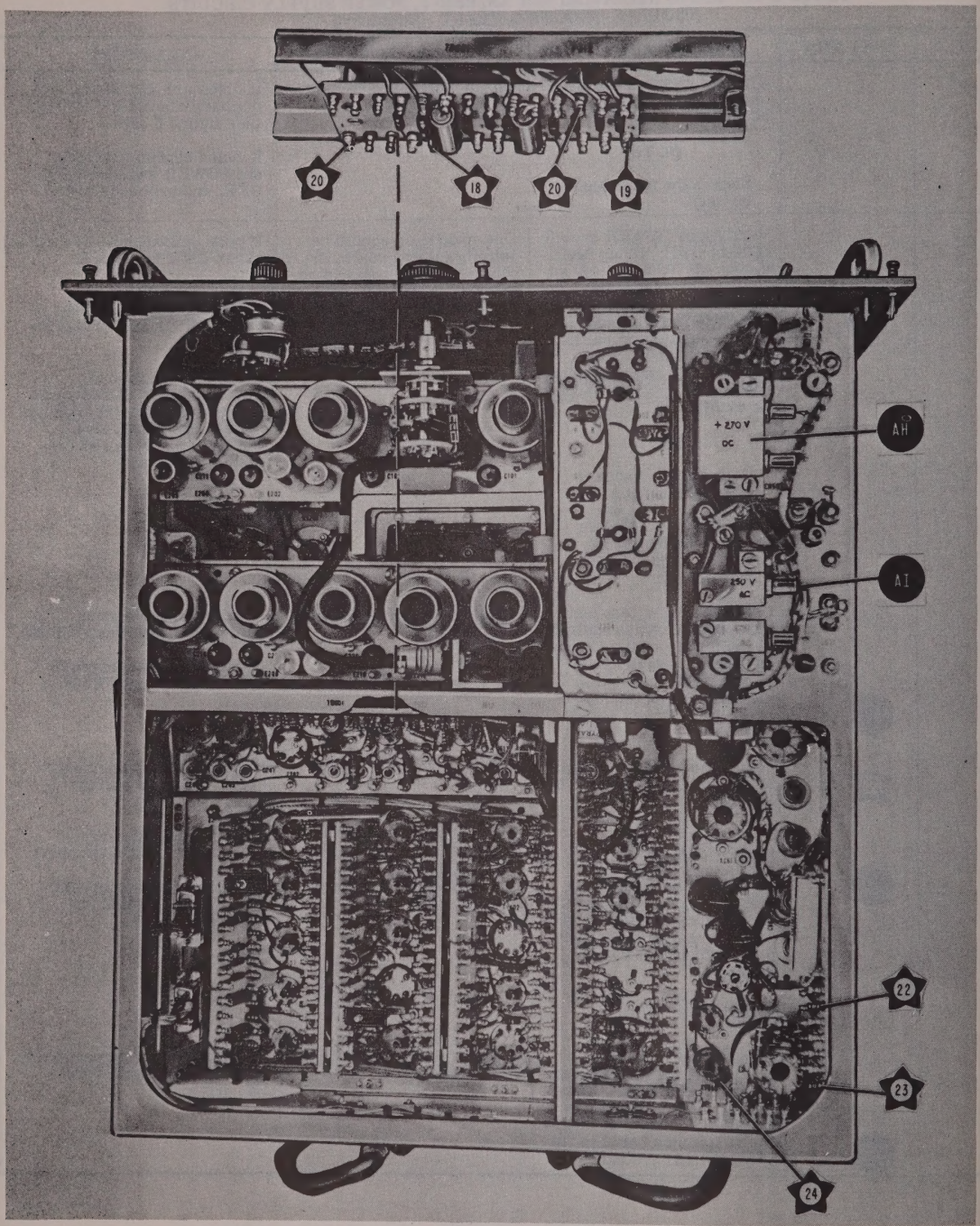
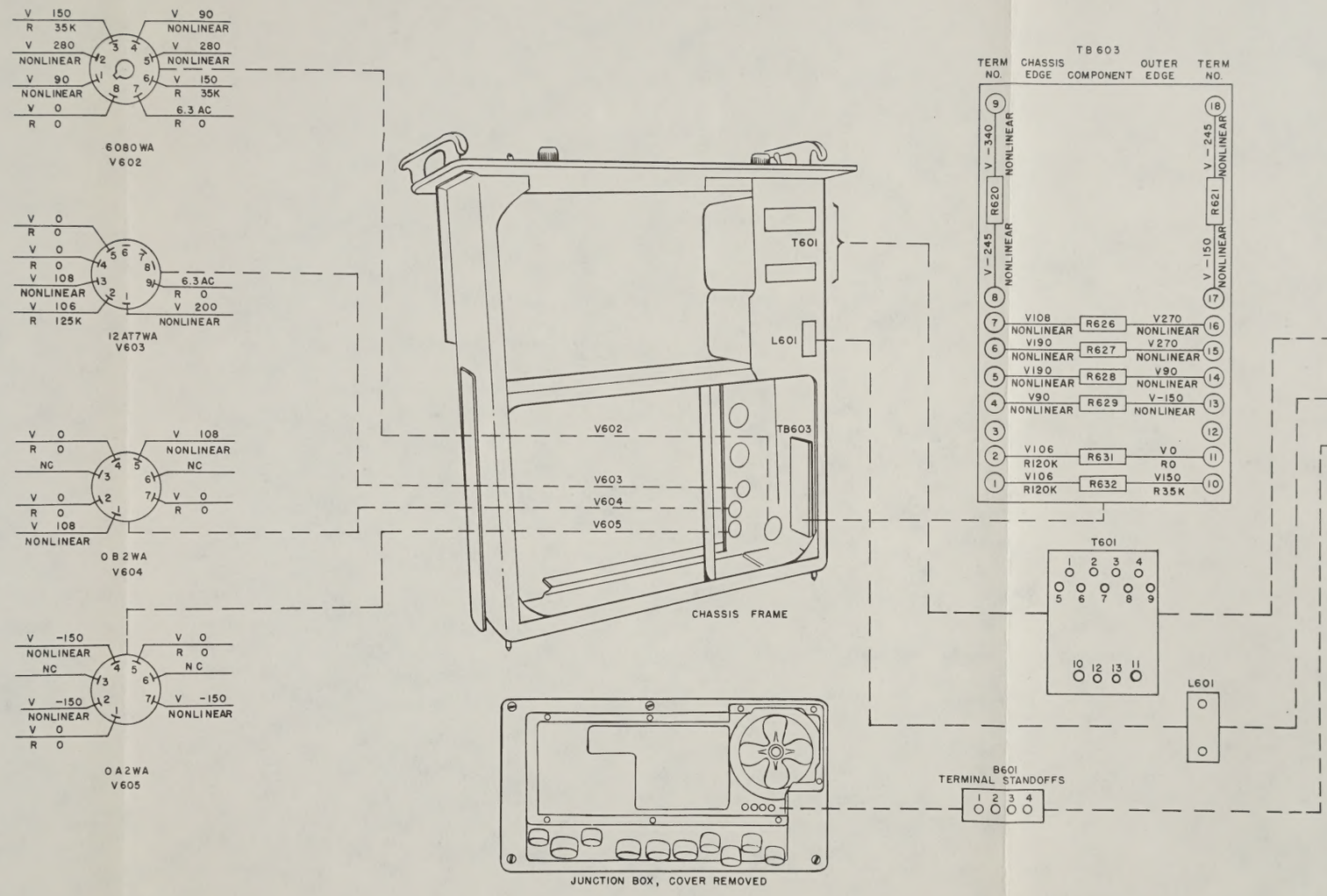


Figure 5-21. Power Supply Circuits, Test Point Locations



COMPONENT	TERMINAL	AC VOLTAGE	RESISTANCE IN OHMS	
			COMPONENT IN CIRCUIT	COMPONENT OUT OF CIRCUIT
T601	12 TO 13	6.3(NOTE 3)	0	0.1
	1 TO 4	125	1.2	1.2
	1 TO 3	115	1.1	1.1
	1 TO 2	105	1.0	1.0
	1 TO GRD	—	∞	∞
	10 TO 11	6.3	0	0
	7 TO 5	250	17	17
	7 TO 9	250	17	17
	7 TO GRD	0	0	∞
	11 TO GRD	0	0	∞
	12 TO GRD	(NOTE 4)	50K	∞
L601	PIN TO PIN	—	120	120
B601 TERMINAL STANDOFFS	1 TO 2	115	1.6	400
	3 TO 4	115	400	400
	2 TO 3	0	0	0
	1 TO 4	—	400	∞

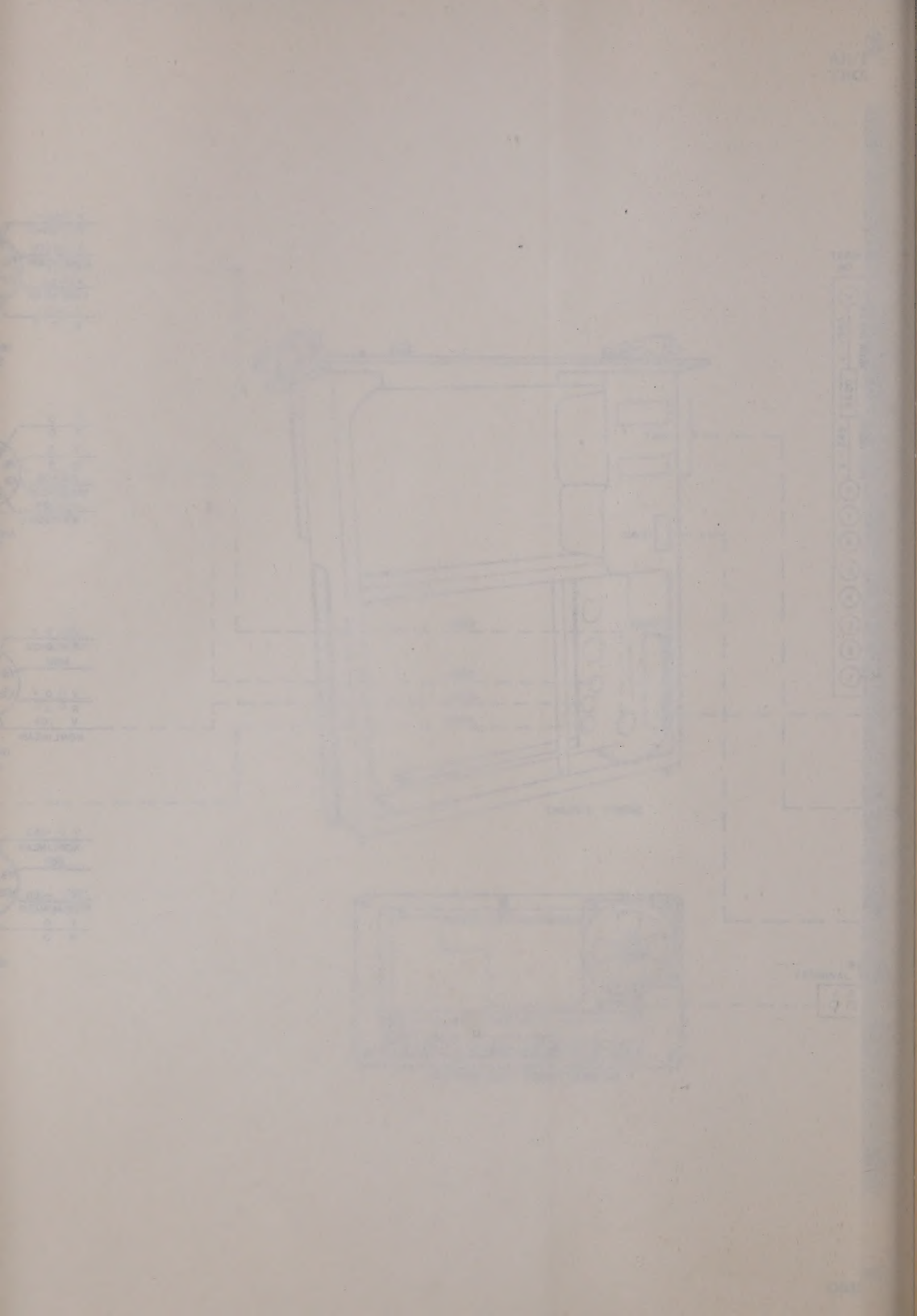
KEY TO SYMBOLS

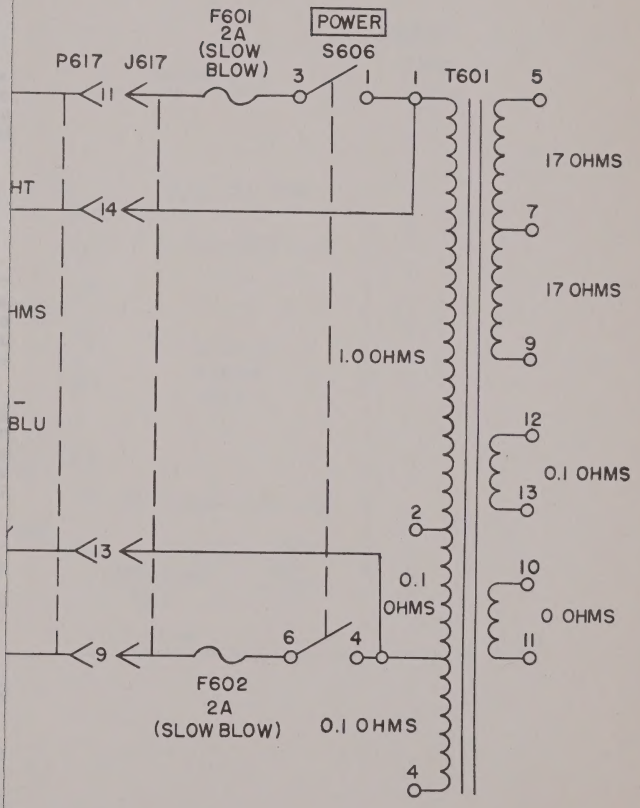
V INDICATES DC VOLTAGE TO GROUND UNLESS OTHERWISE SPECIFIED
AC INDICATES FILAMENT VOLTAGE TO GROUND UNLESS OTHERWISE SPECIFIED
R INDICATES DC RESISTANCE

NOTES:

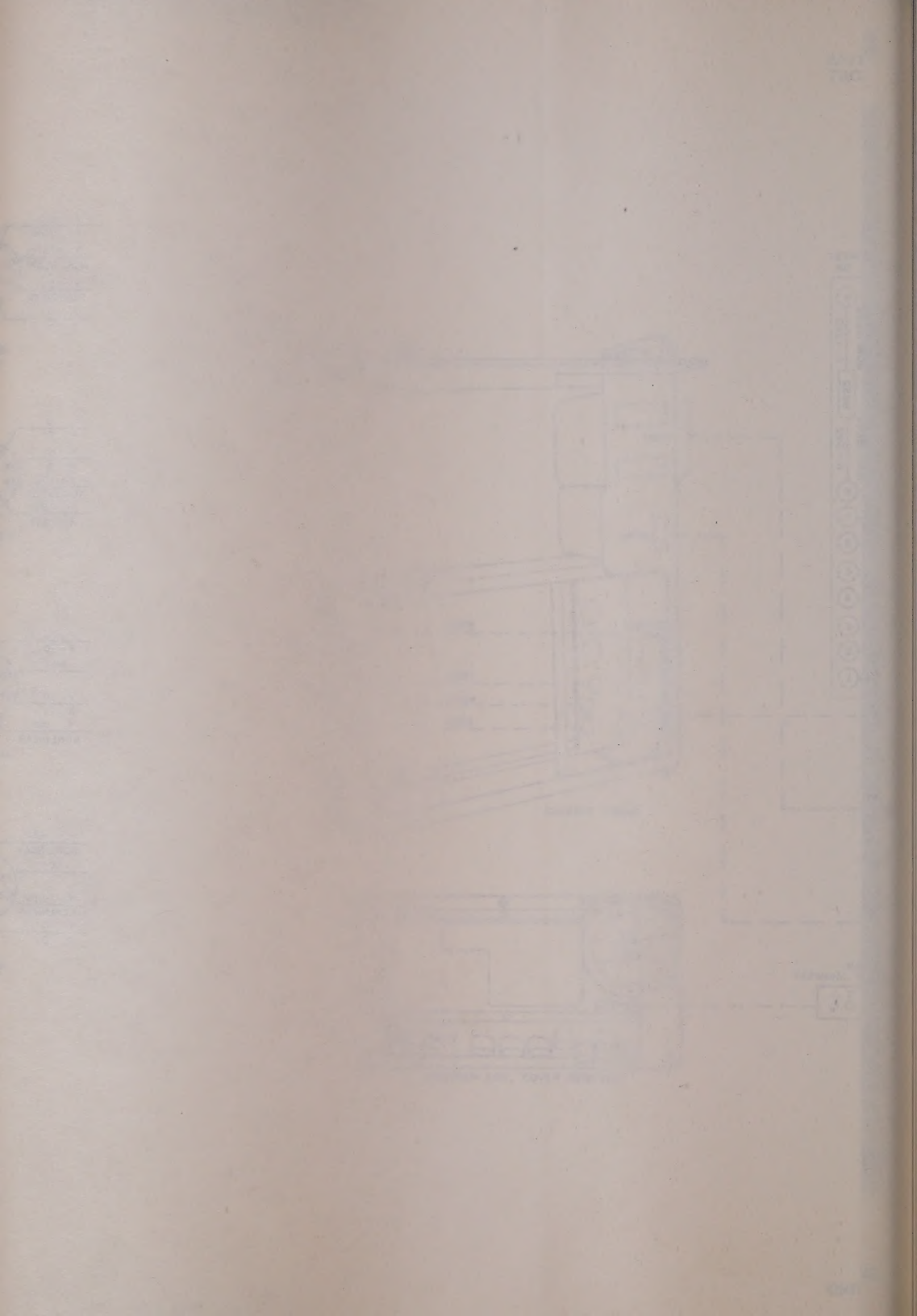
1. REFER TO PARAGRAPH 5-4C FOR CONTROL SETTINGS. (POWER SWITCH MUST BE OFF DURING ALL RESISTANCE MEASUREMENTS).
2. DC AND FILAMENT VOLTAGE READING TAKEN TO GROUND WITH MULTIMETER ME-25A/U, UNLESS OTHERWISE SPECIFIED.
3. MULTIMETER AN/PSM-4 MUST BE USED FOR THIS MEASUREMENT.
4. THIS TERMINAL IS AT -340VDC WITH RESPECT TO GROUND. DO NOT ATTEMPT TO MEASURE THIS VOLTAGE.

Figure 5-22. Power Supply Circuits, Voltage and Resistance Chart





ing Set AN/BRR-3, Primary Power Distribution



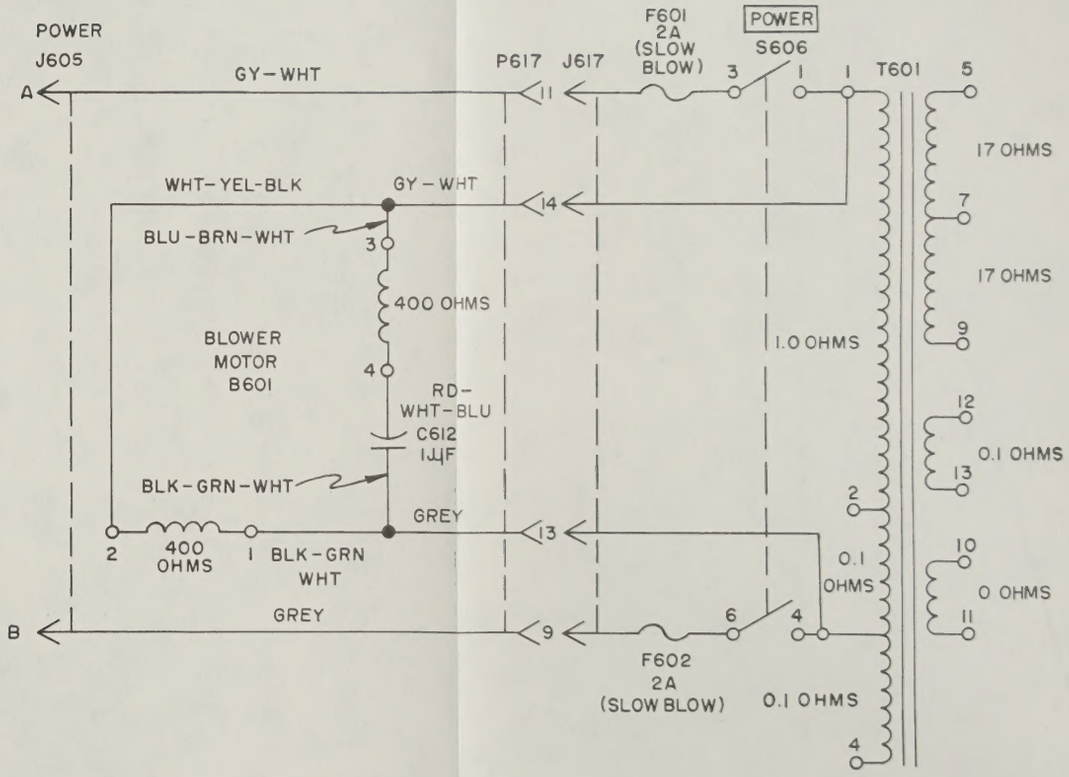


Figure 5-23. Radio Receiving Set AN/BRR-3, Primary Power Distribution

TABLE 5-11. RADIO RECEIVING SET AN/BRR-3, POWER SUPPLY CIRCUITS TROUBLE-SHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
3 (cont.)		Replace V603 and its shield. Perform resistance check at T601 (see figure 5-22).	 Indication as shown in figure 5-22	 If indication is abnormal, check circuit associated with faulty winding for short.
4	22	Using Multimeter ME-25A/U, measure dc voltage between terminal 15 on TB603 and ground.	+260 to +290 vdc	If indication is abnormal, check C604 for open. If trouble persists, perform resistance check at L601 (see figure 5-22). If still abnormal, check +270 vdc bus for short. Finally, check +150 vdc circuit.
	23	Measure dc voltage between terminal 10 on TB603 and ground using Multimeter ME-25A/U.	+145 to +155 vdc	If indication is abnormal, substitute new 6080WA for V602. Then substitute new 12AT7WA for V603. Then substitute new 6627/0B2WA for V604. If trouble persists, perform voltage and resistance check at XV602, XV603, and XV604 (see figure 5-22). If still abnormal, check +150 vdc bus for short.
5	19	Measure dc voltage between terminal 14 on TB601 and ground using Multimeter ME-25A/U.	-325 to -355 vdc	If indication is normal, proceed to step 7. If indication is abnormal, proceed to step 6.
6		Remove V605 and its shield. Measure dc voltage between terminal 14 on TB601 and ground using Multimeter ME-25A/U.	-340 to -400 vdc	If indication is normal, replace V605 and its shield, and proceed to step 7. If indication is abnormal, replace V605 and its shield, and check C607 and C608.
7	24	Measure dc voltage between pin 7 of XV605 and ground using Multimeter ME-25A/U. Set POWER switch S606 to OFF. Remove V605 and its shield.	-145 to -155 vdc	If indication is normal, proceed to step 8. If indication is abnormal, substitute new 0A2WA for V605.
	19	Measure resistance between terminal 14 on TB601 and ground using Multimeter AN/PSM-4.	4,500 to 5,500 ohms	If indication is abnormal, check R620 and R621 circuitry.
	24	Measure resistance between pin 7 of XV605 and ground using Multimeter AN/PSM-4. Note indication on multimeter. Reverse multimeter leads and remeasure resistance. Note indication on multimeter.	Both indications should be greater than 25,000 ohms	If an indication is abnormal, check -150 vdc bus for short.

TABLE 5-11. RADIO RECEIVING SET AN/BRR-3, POWER SUPPLY CIRCUITS TROUBLE-SHOOTING CHART (Continued)

STEP	TEST POINT	PRELIMINARY ACTION	NORMAL INDICATION	NEXT STEP
8	(18)	Using Multimeter ME-25A/U, measure ac voltage between terminal 6 on TB601 and ground.	10 to 12 vac	If indication is abnormal, check crt horizontal deflection voltage circuit.
9		Using Electronic Multimeter ME-6B/U, measure ac ripple voltage between ground and the following test points:		
	(22)	Terminal 15 on TB603	Less than 0.4 vac	If indication is abnormal, substitute new capacitor for C605. If trouble persists, check C604, L601, CR601 and CR602.
	(23)	Terminal 10 on TB603	Less than 0.04 vac	If indication is abnormal, substitute new capacitor for C605. If trouble persists, substitute new 6080WA for V602. If still abnormal, substitute new 12AT7WA for V603. Then, substitute new 6627/OB2WA for V604. Finally, perform voltage and resistance check at XV602, XV603 and XV604 (see figure 5-22).
	(24)	Pin 7 of XV605	Less than 0.02 vac	If indication is abnormal, substitute new capacitor for C608. If trouble persists, substitute new 0A2WA for V605. If still abnormal, check C607, C608, C609, CR603, and CR604.

5-5. TYPICAL TROUBLES.

A list of typical troubles that may occur in the receiver is contained in table 5-12.

TABLE 5-12. RADIO RECEIVING SET AN/BRR-3, TYPICAL TROUBLES

TROUBLE	NATURE OF TROUBLE	SYMPTOMS
Unable to receive signals when ANTENNA SELECTOR switch is at a loop position.	External connections to loop antenna are not properly made, or antenna connector is disconnected at patch panel.	Reduced receiver sensitivity, when operating controls are properly adjusted.
Signal to thermal noise ratio has decreased.	Aging of V201, V202, and V203 increases internal noise level (replace all three tubes).	Sensitivity below minimum standard.
Receiver completely inoperative.	Shorted capacitor C604, or wrong type fuses used. (Slow-blow type are required.)	Fuses continually blow.

SECTION 6

REPAIR

6-1. FAILURE REPORT.

Report each failure of the equipment, whether caused by a defective part, wear, improper operation, or an external cause. Use ELECTRONIC FAILURE REPORT form DD787. Each pad of the forms includes full instructions for filling out the forms and forwarding them to the Bureau of Ships. However, the importance of providing complete information cannot be emphasized too much. Be sure that you include the model designation and serial number of the equipment (from the equipment identification plate), the type number and serial number of the major unit (from the major unit identification plate), and the type number and reference designation of the particular defective part (from the technical manual). Describe the cause of the failure completely, continuing on the back of the form if necessary. Do not substitute brevity for clarity. And remember—there are two sides to the failure report—

YOUR SIDE

Every FAILURE REPORT is a boost for you:

1. It shows that you are doing your job.
2. It helps make your job easier.
3. It insures available replacements.
4. It gives you a chance to pass your knowledge to every man on the team.

BUREAU SIDE

The Bureau of Ships uses the information to:

1. Evaluate present equipment.
2. Improve future equipment.
3. Order replacements for stock.
4. Prepare field changes.
5. Publish maintenance data.

Always keep a supply of failure report forms on board. You can get them from the nearest Forms and Publications Supply Point.

6-2. TUNING AND ADJUSTMENTS.

a. TEST EQUIPMENT AND SPECIAL TOOLS. - Electronic Multimeter ME-25A/U is required to accomplish the periodic check recommended for the teletype circuit.

NOTE

A low impedance nonelectronic dc voltmeter must not be used.

b. CONTROL SETTINGS. - The control settings for performing the adjustment procedure are specified within the procedure.

c. RF, IF, AND AUDIO CIRCUITS. - All RF, IF, and audio alignment trimmers in Radio Receiving Set AN/BRR-3 (the receiver) are factory aligned and then sealed. Periodic field alignment of these circuits is not required. If careful testing and retesting indicate a transformer (T101, T102, T201, T202, T203, T204, T205, T206, or T207) to be electrically defective, it shall be removed, and the replacement transformer installed. Since the replacement transformers are factory aligned and sealed, no field adjustments are required.

If careful testing and retesting indicate a trimmer capacitor (C101, C103, C206, C211, C221, C226, or C231) to be defective or damaged, it shall be removed, and a repair trimmer capacitor installed in its place. Adjust the replacement capacitor as follows.

If the defective capacitor is not destroyed, measure the lead screw protruding from the body of this capacitor. Then adjust the new capacitor so that its lead screw is the same length. Adjust the capacitor by turning the brass collar protruding from the body of the capacitor. Do not turn the lead screw. Apply glyptal to the screw. If the defective capacitor is destroyed, adjust the replacement capacitor so that its tuning slug is at midpoint.

Other filters, inductors, or transformers in the receiver (Z201, Z202, Z203, Z301, Z302, Z303, Z304, Z305, Z306, Z401, Z501, L101, L601, T401, and T601) are packaged in hermetically sealed containers. Replace any of these parts only after careful checking and rechecking of trouble pinpoints the part as defective. No adjustments are required.

d. TELETYPE CIRCUIT. - Adjustments shall be made in the teletype circuits on a periodic basis as required in the Maintenance Standards Book, or whenever tubes V504, V505, V506, or V507 are replaced by new tubes. The adjustments, which assure optimum performance, are as follows:

Step 1. Place receiver in service position, front panel up (see paragraph 6-3a).

Step 2. Set POWER switch to ON and allow receiver to warmup for at least 10 minutes.

Step 3. Set CRT switch to FSK TUNE.

Step 4. Set FSK SENSE switch to HOLD.

Step 5. Temporarily remove V503 and its shield for test.

Step 6. Adjust R521 (see figure 6-1(21)) to vertically center the trace on crt indicator.

Step 7. Connect dc vtvm Multimeter ME-25A/U (-50 vdc scale) between pin 7 of XV507 (22) and ground.

NOTE

A low impedance nonelectronic dc voltmeter must not be used.

Step 8. Adjust R534 (26) until the vtvm reads -10 vdc.

Step 9. Replace V503 and its shield.

Step 10. Ascertain whether the teletypewriter or reperforator magnet current rating is 60 or 20 ma. If a machine requiring 60 ma is being used, leave both driver tubes, V508 and V509, in their sockets. If a machine requiring 20 ma is being used, remove V509 from its socket, leaving only one driver tube in the circuit. When in doubt as to the type of machine being used, leave both driver tubes in their sockets.

Step 11. Place receiver chassis in the operational position (see paragraph 6-3b).

e. CRT CIRCUIT. - There is no need to have the square pattern, which results when the CRT switch is in the SET LEVEL position, centered on the crt indicator. Therefore, no centering adjustments, either vertical or horizontal, are required or are available in this position.

Variable resistors R521 and R534 should not be adjusted in a mistaken effort to center the square pattern on the crt when the CRT switch is in the SET LEVEL position.

6-3. SERVICING THE RECEIVER.

All electronic sections of the receiver are mounted on the receiver chassis. The receiver chassis, which is mounted on the slide assemblies, is quickly and easily put into a servicing position. When the receiver chassis is withdrawn from the cabinet, it is locked in the horizontal position with the rear of the receiver chassis 3-3/4 inches in front of the cabinet. The receiver chassis can be rotated to and locked in any of the following seven servicing positions; the horizontal position, or at 45, 90, and 105 degree positions front panel up or front panel down (see figures 1-5 and 1-6).

The flexible interconnecting cables which are part of the cabinet assembly permit testing the receiver without additional jumper cables. All tubes and the majority of components can be changed without disassembly of the receiver.

a. SERVICING POSITION. - In order to put the receiver in a servicing position, proceed as follows:

Step 1. Loosen the six quarter turn fasteners (see figure 2-1) on the front panel.

Step 2. Pull the receiver chassis fully from the cabinet until the stop latch buttons (see figure 6-2(3)) and the automatic stop latch buttons (1) of the slide assemblies engage.

Step 3. Press the latch triggers (8) located under each front handle (9).

Step 4. Rotate the receiver chassis with front panel up or down as desired.

Step 5. Release the latch triggers as the desired rotational position is approached. Continue rotating the receiver chassis until both latch bolts (7) engage in the tilt lock detents (6).

b. OPERATIONAL POSITION. - In order to return the receiver to the operational position, proceed as follows:

Step 1. Press the latch triggers located under each front handle and rotate the receiver chassis to the horizontal position. Check that both latch bolts are engaged in the tilt lock detents. Check that receiver chassis is pulled fully from cabinet.

Legend for Figure 6-1.

1 RF Head
2 Antenna Selector Switch Shaft Extension Set Screw
3 RF Tuning Control Shaft Extension Set Screws (Hidden)
4 Chassis Frame Cable
5 Captive Screw (Four)
6 Bandwidth Switch Set Screw Access Hole
7 Z302
8 Narrow Band IF Filters
9 Power Transformer T601
10 Chassis Frame
11 CR601
12 Lucite Plate
13 CR602
14 Heat Sink for CR601 and CR602
15 CR603
16 CR604
17 Heat Sinks for CR603
18 Lucite Plate Screw (Six)
19 Bristo Wrench
20 Rear Deck
21 R521
22 XV507
23 R546
24 P614
25 P615
26 R534
27 P613
28 P612
29 Z304
30 Open Clamp (Two)
31 Z303

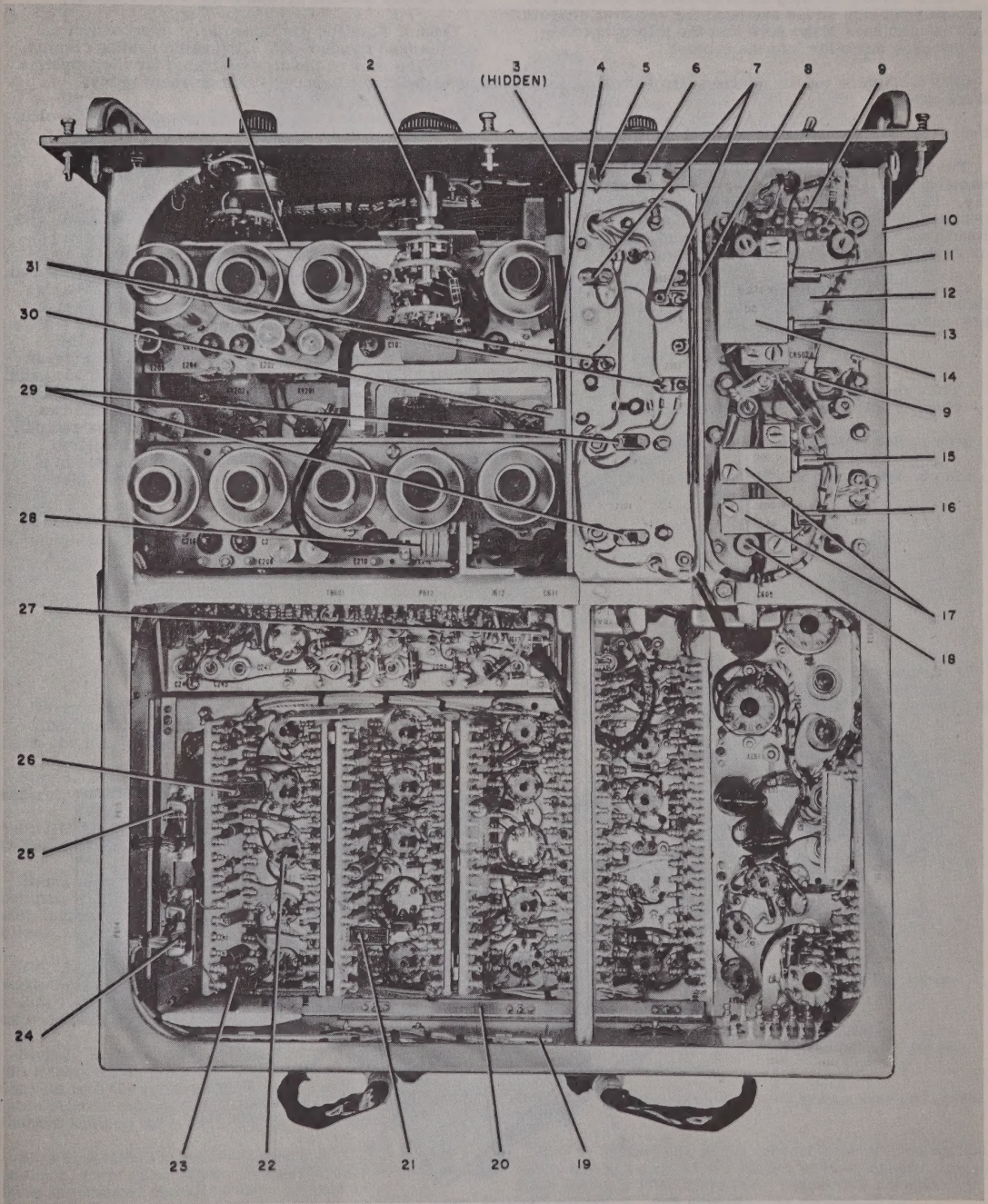


Figure 6-1. Receiver Chassis, Bottom View

Step 2. Press the stop latch buttons on each side of the intermediary slides and push the receiver chassis into the cabinet. Make sure that the interconnecting cables feed smoothly into the cabinet.

Step 3. Tighten the six quarter turn fasteners on the front panel.

6-4. REMOVING AND REPLACING ASSEMBLIES.

The receiver is composed of two major assemblies; namely, the receiver chassis and the cabinet assembly. The mechanical arrangement of the receiver permits easy and quick disassembly and reassembly. Read this entire section before attempting to remove or replace any assembly or subassembly.

a. REMOVING THE RECEIVER CHASSIS. (See figure 6-3.) - In order to remove the receiver chassis, proceed as follows:

CAUTION

The removal and reassembly of the receiver chassis will always be performed by two men.

Step 1. Set POWER switch to OFF.

Step 2. Withdraw the receiver chassis fully from the cabinet (see paragraph 6-3a, steps 1 and 2).

Step 3. Note the positions of the interconnecting cables (see figure 6-4(1)) and cable holding clamps (3) on the rear of the chassis frame for they must be returned to the exact position on reassembly.

Step 4. Loosen the two cable clamps from the chassis frame. Each clamp is secured by two quarter turn fasteners (2). Do not loosen the cable ties (4) on the cable at the rear of the connector plug.

Step 5. Disconnect cable connector plugs P611 (10) and P617 (5) from connector receptacles J611 (9) and J617 (8) on the chassis frame. These plugs are removed by grasping the connector plug ring (7) and pulling outward until the orange color band is covered.

Step 6. Place loose cables in the cabinet.

Step 7. Remove the receiver chassis from the extended slides. In order to do this, each man must grasp a front handle (see figure 6-2(9)) with one hand. Next they must take firm hold of the rear side of the chassis frame with their other hand, press the two stop latch buttons (3) on the slide assemblies and pull the receiver chassis free from the intermediary slides (2). Then they set the receiver chassis in a safe place on the right side (crt side down). (See figure 6-5.)

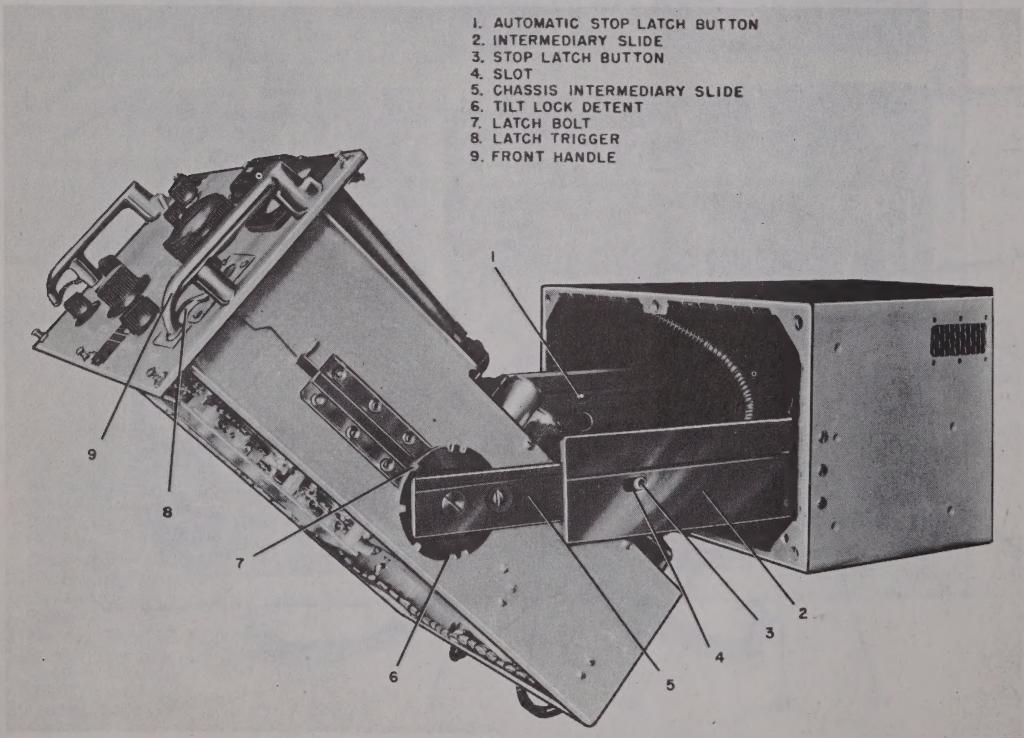


Figure 6-2. Receiver Chassis, Side Assembly Detail

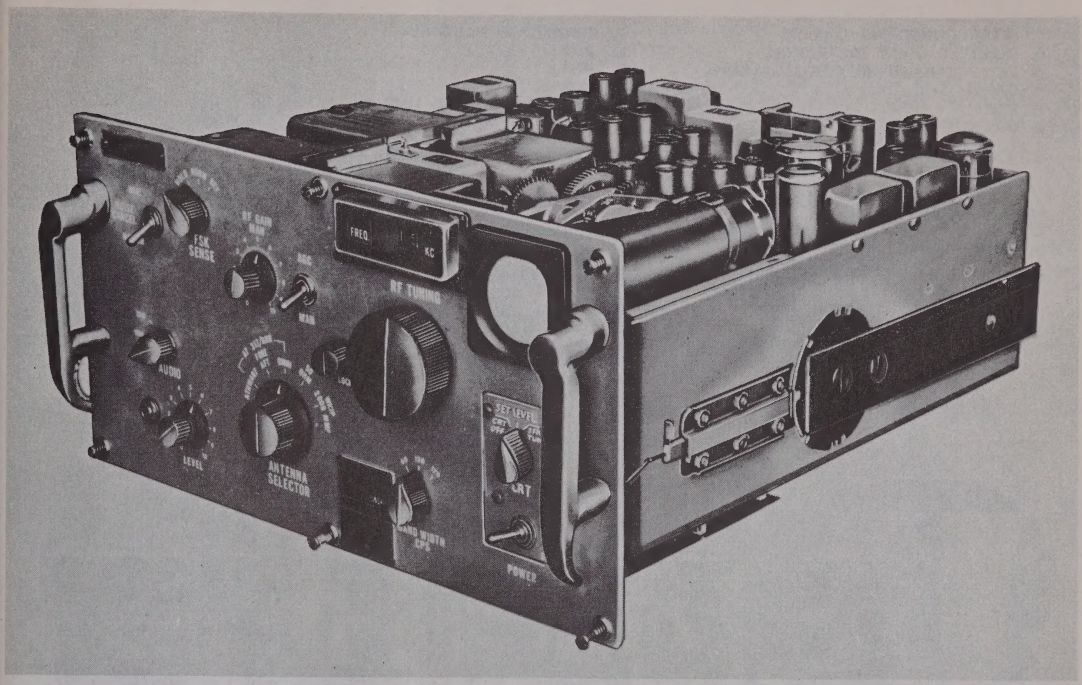


Figure 6-3. Receiver Chassis

CAUTION

Never set the receiver chassis down in any other position because this could cause damage to the equipment.

Step 8. Push the extended slide assemblies into the cabinet.

b. REPLACING THE RECEIVER CHASSIS. - In order to replace the receiver chassis, proceed as follows:

Step 1. Fully extend the slide assemblies from the cabinet. It will be necessary to press the automatic stop latch buttons (see figure 2-5) on the slide assemblies.

Step 2. With two men handling the receiver chassis, mate the chassis intermediary slides (see figure 6-2(5)) with the respective, intermediary slides (2) extended from the cabinet.

Step 3. Press the stop latch buttons (3) on the chassis intermediary slide section and slide the receiver chassis into the intermediary slides until the stop latch buttons engage in the slots (4). Double check that the buttons have fully clicked into the slots.

Step 4. Rotate the receiver chassis to a 45 degree position, front panel down. Withdraw the two cables from the cabinet and allow them to hang free from the front of the cabinet assembly.

Step 5. Bring the free ends of the cables up, one at a time, behind the receiver chassis without twisting or turning them so that they are in the same position as noted in paragraph 6-4a, step 3.

Step 6. Connect the cables to the receiver chassis. This is accomplished by first checking that the connector plug ring is covering the orange band; then grasping the body of the connector plug, mating the keyway of the connector plug with the key of the connector receptacle, and pushing until a click is heard or felt and the orange band around the connector plug becomes visable.

Step 7. Secure the cable holding clamps to the chassis frame by means of the two quarter turn fasteners in each cable clamp.

Step 8. Return the receiver chassis to the operational position (see paragraph 6-3b).

c. REMOVING THE CABINET ASSEMBLY. (See figure 6-6). - In order to remove the cabinet assembly, proceed as follows:

Step 1. Remove the receiver chassis (see paragraph 6-4a).

Step 2. If the rear of the cabinet assembly is accessible, tag and remove all cables by disconnecting plugs P601 through P610 from their respective receptacles at the junction box. Remove the ground strap.

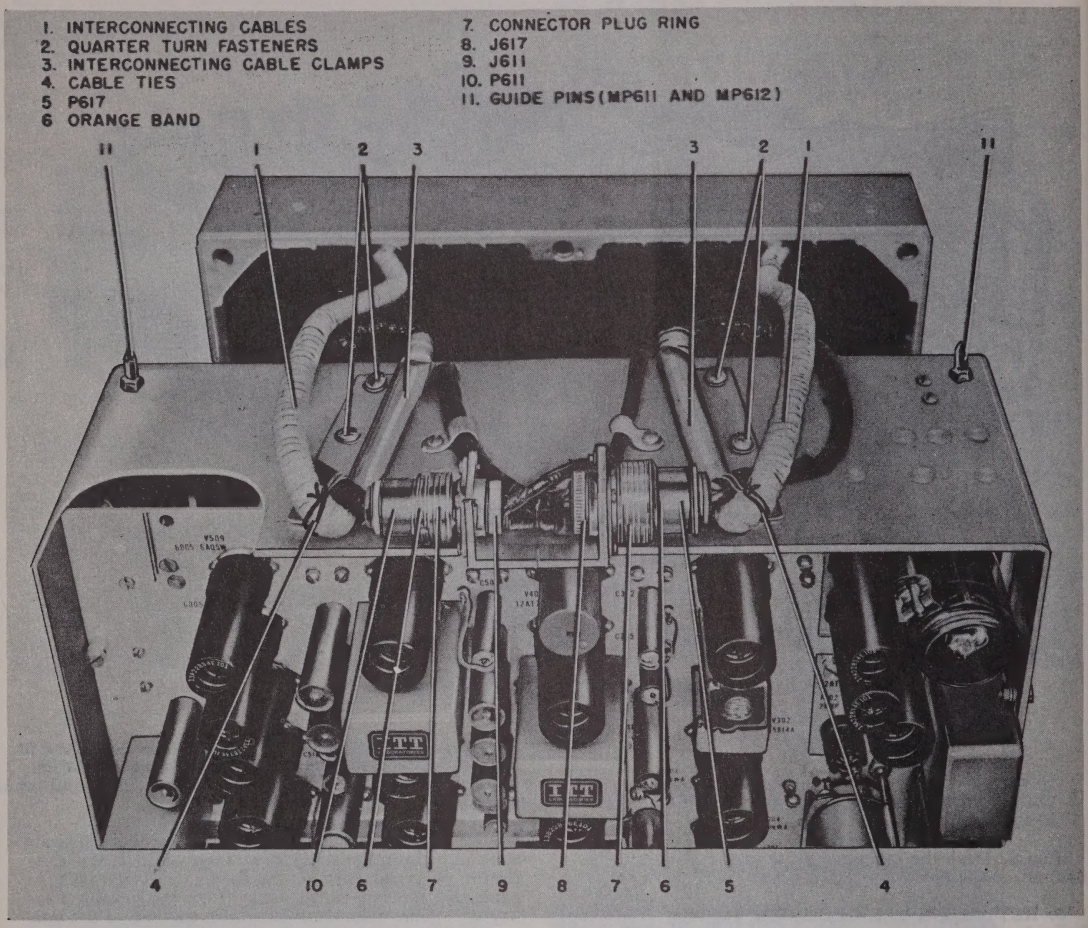

1. INTERCONNECTING CABLES
2. QUARTER TURN FASTENERS
3. INTERCONNECTING CABLE CLAMPS
4. CABLE TIES
5 P617
6 ORANGE BAND
7. CONNECTOR PLUG RING
8. J617
9. J611
10. P611
11. GUIDE PINS (MP611 AND MP612)
11 1 2 3 3 2 1 11
4 10 6 7 9 8 7 6 5 4

Figure 6-4. Receiver Chassis, Cable and Clamp Detail

Step 3. Remove the cabinet mounting hardware from the inside bottom of the cabinet. At installations using shock mounts, remove four 1/4-inch machine screws and lockwashers (one in each corner of the cabinet base). At installations where shock mounts are not used, remove six 5/16-inch bolts, nuts, and lockwashers (three along each side of the cabinet base).

Step 4. Remove the cabinet assembly from the table top. In order to do this at installations where the rear of the cabinet assembly is not accessible, carefully slide it forward until the connectors on the rear are accessible.

Step 5. Tag and remove all cables from the receptacles (if this was not done in step 2) taking precautions to prevent cables from falling into inaccessible positions.

d. REPLACING THE CABINET ASSEMBLY. - In order to replace the cabinet assembly, proceed as follows:

Step 1. At installations where the rear of the cabinet assembly will not be accessible after mounting, connect all cables to the junction box, connecting plugs P601 through P610 to their respective receptacles (see figure 2-7). Carefully slide the cabinet assembly into its mounting position, taking care not to snag or twist the cables.

Step 2. Fasten the cabinet assembly to the table top with six 5/16-inch bolts, nuts, and lockwashers, if shock mounts are not used; or with four 1/4-inch machine screws and lockwashers, if shock mounts are used.

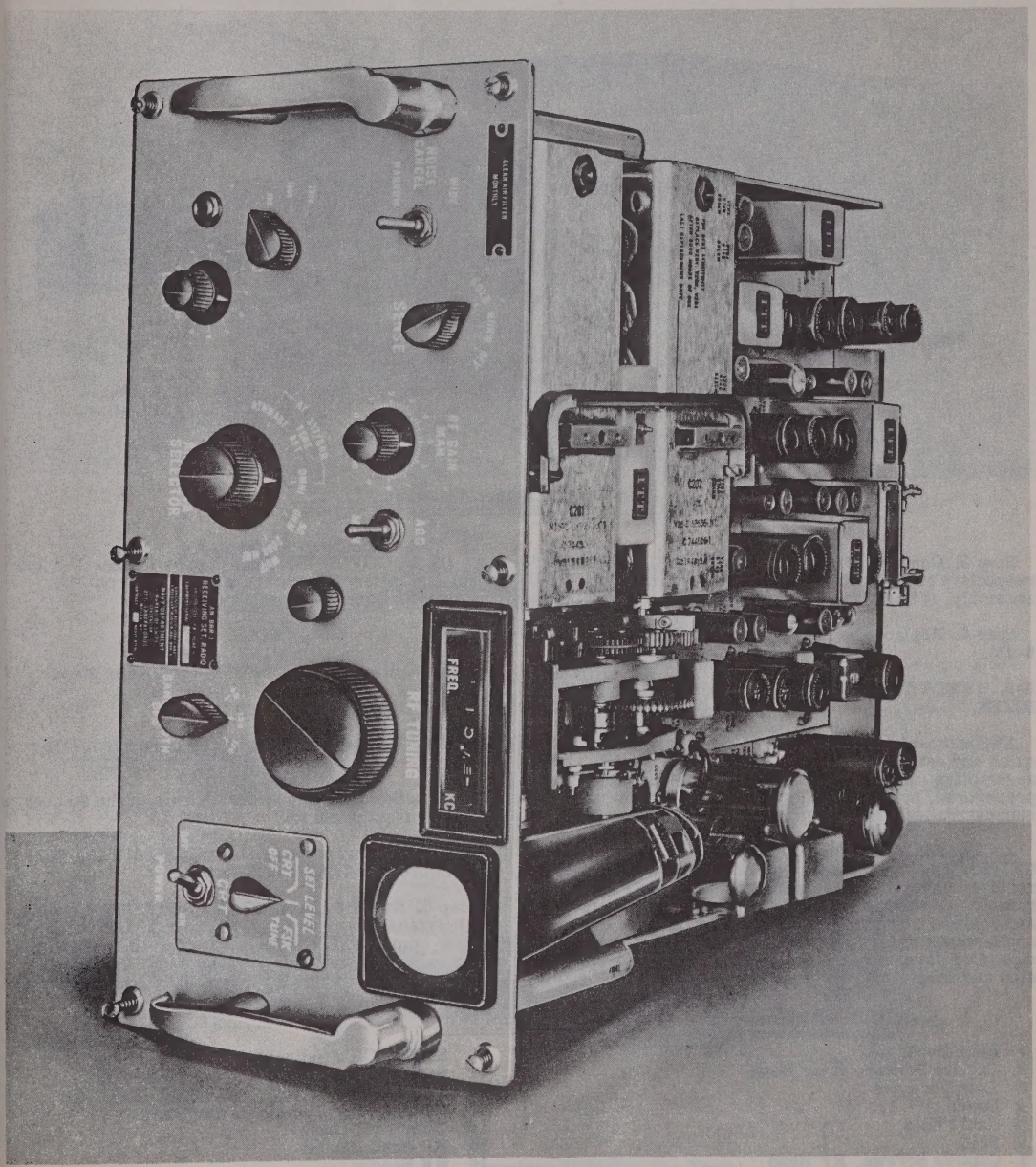


Figure 6-5. Receiver Chassis, Stored Position

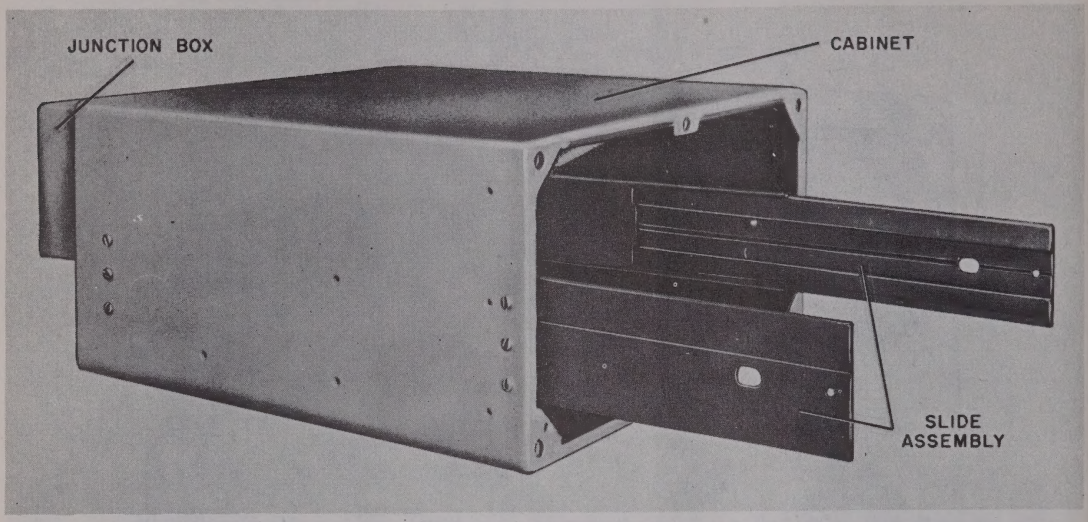


Figure 6-6. Cabinet Assembly

Step 3. Connect plugs P601 through P610 to their respective receptacles at the rear of the cabinet assembly, if this was not done in step 1.

Step 4. Replace the receiver chassis (see paragraph 6-4b).

6-5. REMOVAL AND REASSEMBLY OF SUBASSEMBLIES.

The mechanical and electrical arrangement permits quick and easy disassembly and reassembly of subassemblies. Before proceeding with the disassembly procedures, provide a clear, safe area to place the subassemblies as they are removed.

a. DISASSEMBLY AND REASSEMBLY OF RECEIVER CHASSIS. (See figures 6-1 and 6-7.) - The receiver chassis is composed of four subassemblies; namely, RF head, rear deck, narrow band IF filters, and chassis frame. The first three subassemblies are fastened to the chassis frame and can be removed by disconnecting connector plugs and receptacles and loosening captive screws.

(1) REMOVING RF HEAD. (See figures 1-8 and 6-8.) - In order to remove the RF head from the receiver chassis, proceed as follows:

NOTE

Never change the order of the following steps.

Step 1. Set POWER switch to OFF.

Step 2. Withdraw the receiver chassis from the cabinet (see paragraph 6-3a, steps 1 and 2).

Step 3. Rotate the receiver chassis to the 90 degree position, front panel up.

Step 4. Disengage connector plugs P612 and P613 (see figure 6-1(28) and (27)).

Step 5. Remove the ANTENNA SELECTOR switch shaft extension and knob. Do not attempt to loosen the rubber cemented set screws securing the knob to the shaft extension; instead use the special long handled Bristo wrench provided to reach up behind the front

Legend for Figure 6-7.

1 Rear Deck
2 Captive Screws, Rear Deck
3 Transformers
4 Fuses
5 Cable Hole
6 P301
7 Captive Screws, RF Head
8 Base Plug, CRT Indicator
9 Neck Clamp, CRT Indicator
10 Shield, CRT Indicator
11 Securing Screws, Counter
12 Bezel
13 Cathode Ray Tube Indicator V601
14 Clip, Dial Lamp
15 RF Head Handle
16 RF Head
17 Securing Screws, Tension Spring

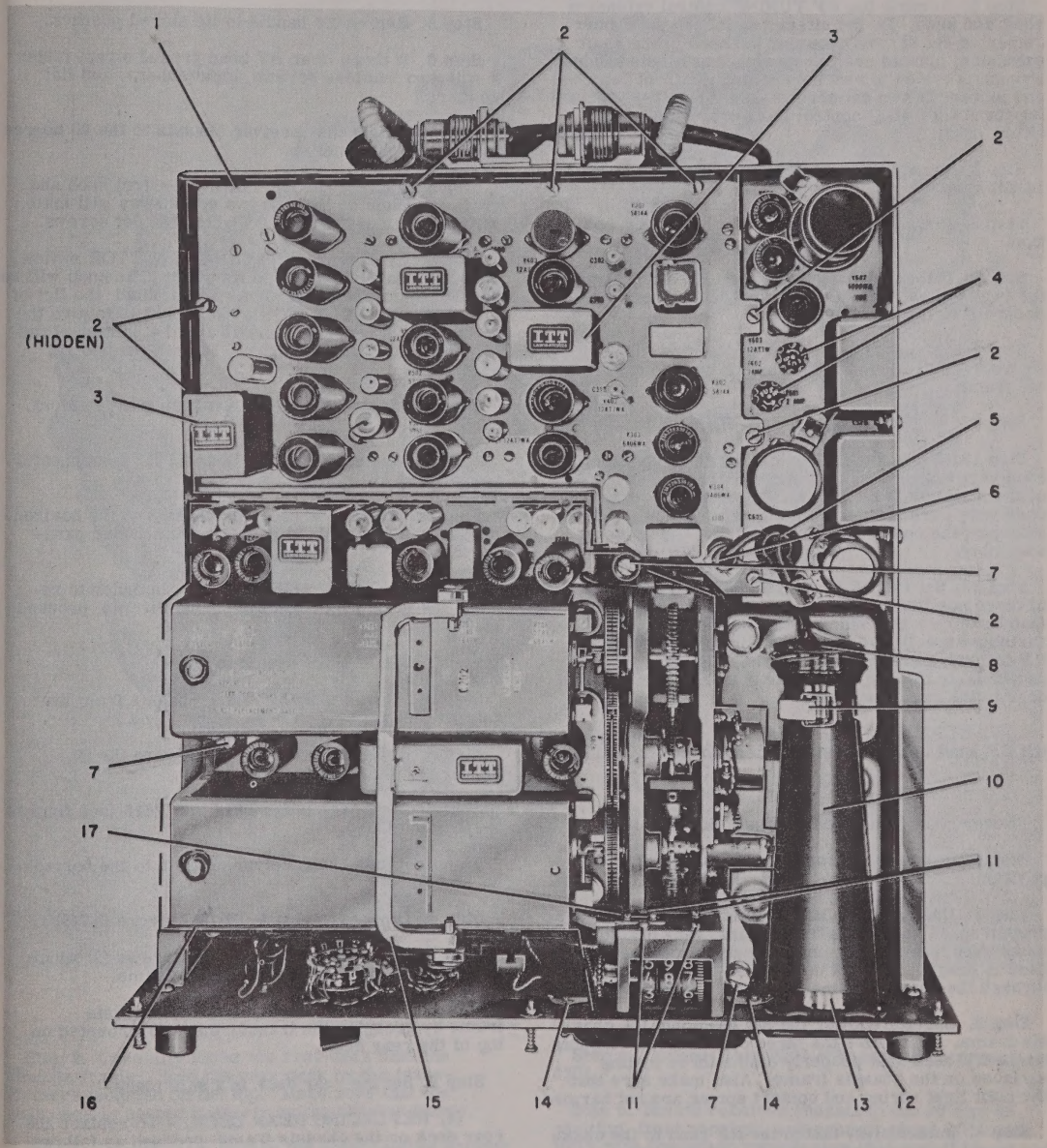


Figure 6-7. Receiver Chassis, Top View

panel and loosen the two set screws (see figure 6-9) securing the ANTENNA SELECTOR switch shaft extension to the switch shaft.

Step 6. Remove the RF TUNING control extension shaft and knob. Do not attempt to loosen the rubber cemented set screws securing the knob to the shaft extension; instead use the special long handled Bristo wrench provided to reach up behind the front panel and loosen the two set screws (see figure 6-9) securing the RF TUNING control shaft extension to the tuning shaft.

Step 7. Remove (rotate counterclockwise) the dial LOCK knob.

Step 8. Rotate the receiver to the horizontal position.

Step 9. If there is an RF head ground strap, remove the two screws, lockwashers, and flat washers which secure it to the chassis frame.

Step 10. Loosen the three captive screws (see figure 6-7(7)) which secure the RF head to the chassis frame.

Step 11. Vertically position the RF head handle (15).

Step 12. Grasp the handle and carefully lift the RF head vertically out of the receiver chassis. Because of the small clearances involved, this lifting must be done very carefully so as not to damage any parts; for example, the counter dial or the pilot light contact assembly.

Step 13. Set the RF head in a safe place in any one of three positions: with the RF transformers down (handle up); on that side resting on the back of the variable capacitors (gear assembly up); or with the RF transformers up (handle down). In all positions, particularly the last one, make sure no harm can be done to the gear assembly.

(2) REPLACING RF HEAD. - In order to replace the RF head in the chassis frame, proceed as follows:

NOTE

Never change the order of the following steps.

Step 1. Rotate the chassis frame to the horizontal position.

Step 2. Use handle to hold RF head vertically above proper space in chassis frame; also, very carefully make sure that the long antenna cable from the RF head is hanging straight down so as to feed properly through the chassis frame.

Step 3. Carefully lower the RF head onto the chassis frame. Make sure the three captive screw mounts on the RF head seat properly on the three mating surfaces on the chassis frame. Also make sure that the pilot light wiring and contact spring are not harmed.

Step 4. Immediately fasten the RF head to the chassis frame by means of the three captive screws. Tighten the screws securely; however, do not over tighten.

CAUTION

Do not leave the RF head in the chassis frame unless the three captive screws are secured.

Step 5. Return the handle to its stored position.

Step 6. If there is an RF head ground strap, fasten it with two machine screws, lockwashers, and flat washers.

Step 7. Rotate the receiver chassis to the 90 degree position, front panel up.

Step 8. Replace the RF TUNING control knob and shaft extension so that the two set screws will mate with the flats of the shaft. Tighten the set screws.

Step 9. Replace the ANTENNA SELECTOR switch knob and shaft extension on its shaft. The knob will be positioned correctly if, when reassembled, the flat of the ANTENNA SELECTOR switch shaft is toward the bottom of the receiver chassis and the pointer of the knob is at the OMNI position. Tighten the two set screws.

Step 10. Screw the dial LOCK knob into the front panel.

Step 11. Connect plugs P612 and P613 to connector receptacles J612 and J613, respectively.

Step 12. Rotate the receiver chassis to the horizontal position and replace it in the cabinet (see paragraph 6-3b).

(3) REMOVING REAR DECK. - In order to remove the rear deck from the chassis frame, proceed as follows:

Step 1. Set POWER switch to OFF.

Step 2. Withdraw the receiver chassis from the cabinet (see paragraph 6-3a, steps 1 and 2).

Step 3. Rotate the receiver chassis to the 90 degree position, front panel up.

Step 4. Disengage plugs P614 and P615 (see figures 6-1(24) and (25)).

Step 5. Rotate the receiver chassis to the horizontal position.

Step 6. Disengage plug P301 (see figure 6-7(6)).

Step 7. Loosen the eight captive screws (2) which secure the rear deck to the chassis frame.

Step 8. Lift the rear deck from the chassis frame by grasping the transformers (3) mounted on top of the rear deck.

Step 9. Set the rear deck in a safe place.

(4) REPLACING REAR DECK. - To replace the rear deck on the chassis frame, proceed as follows:

Step 1. Rotate the chassis frame to the horizontal position.

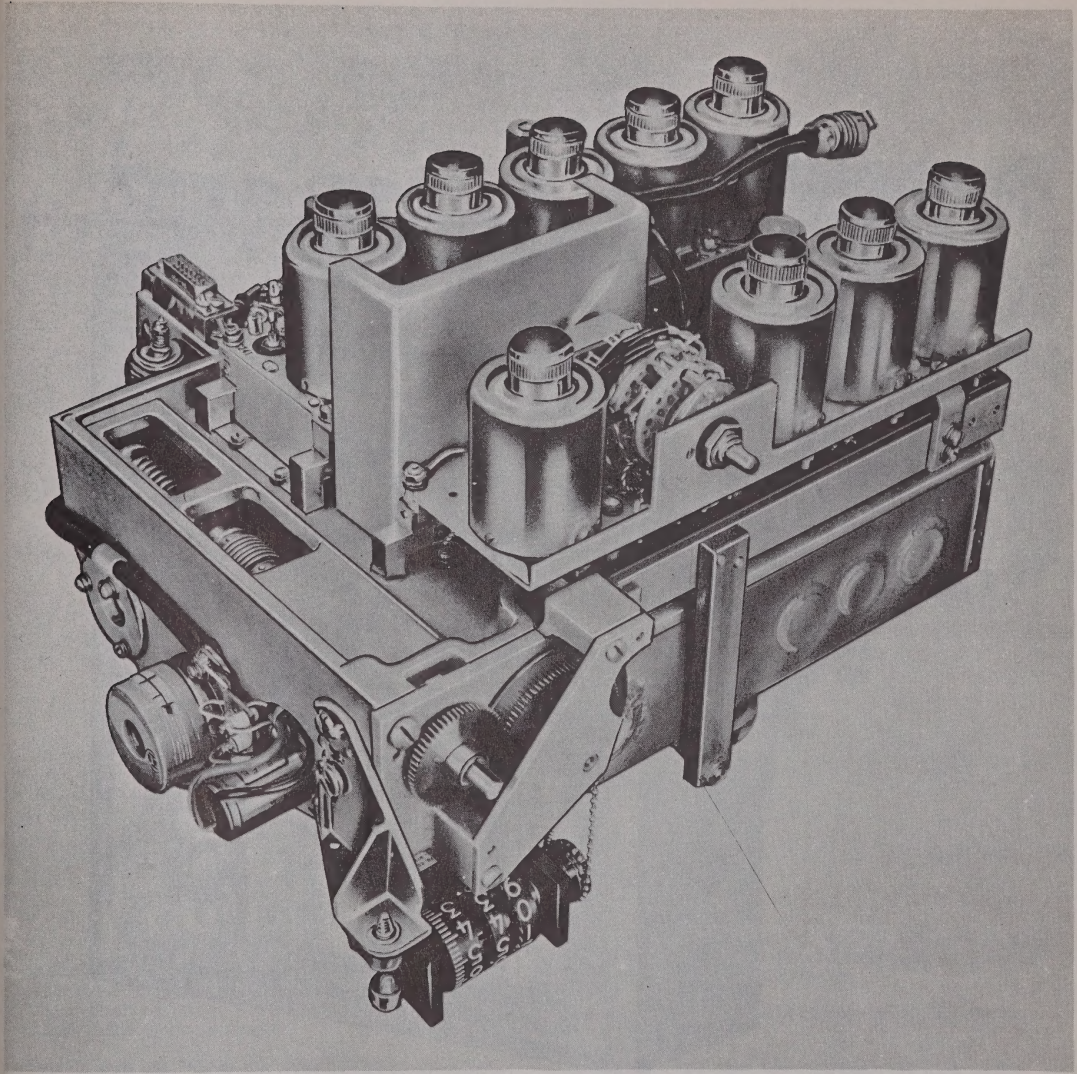


Figure 6-8. RF Head, Bottom Oblique View

Step 2. Carefully lower the rear deck onto the chassis frame. Hold the rear deck by the transformers mounted on the top. Make sure that the rear deck is seated properly on the chassis frame.

Step 3. Immediately tighten the eight captive screws securely. Do not over tighten.

CAUTION

Do not leave the rear deck in chassis frame unless the eight captive screws are secured.

Step 4. Connect plug P301 with connector receptacle J301.

Step 5. Rotate receiver chassis to the 90 degree position, front panel up, and connect plugs P614 and P615 with connector receptacles J614 and J615, respectively.

Step 6. Rotate the receiver chassis to the horizontal position, and return chassis to the operational position (see paragraph 6-3b).

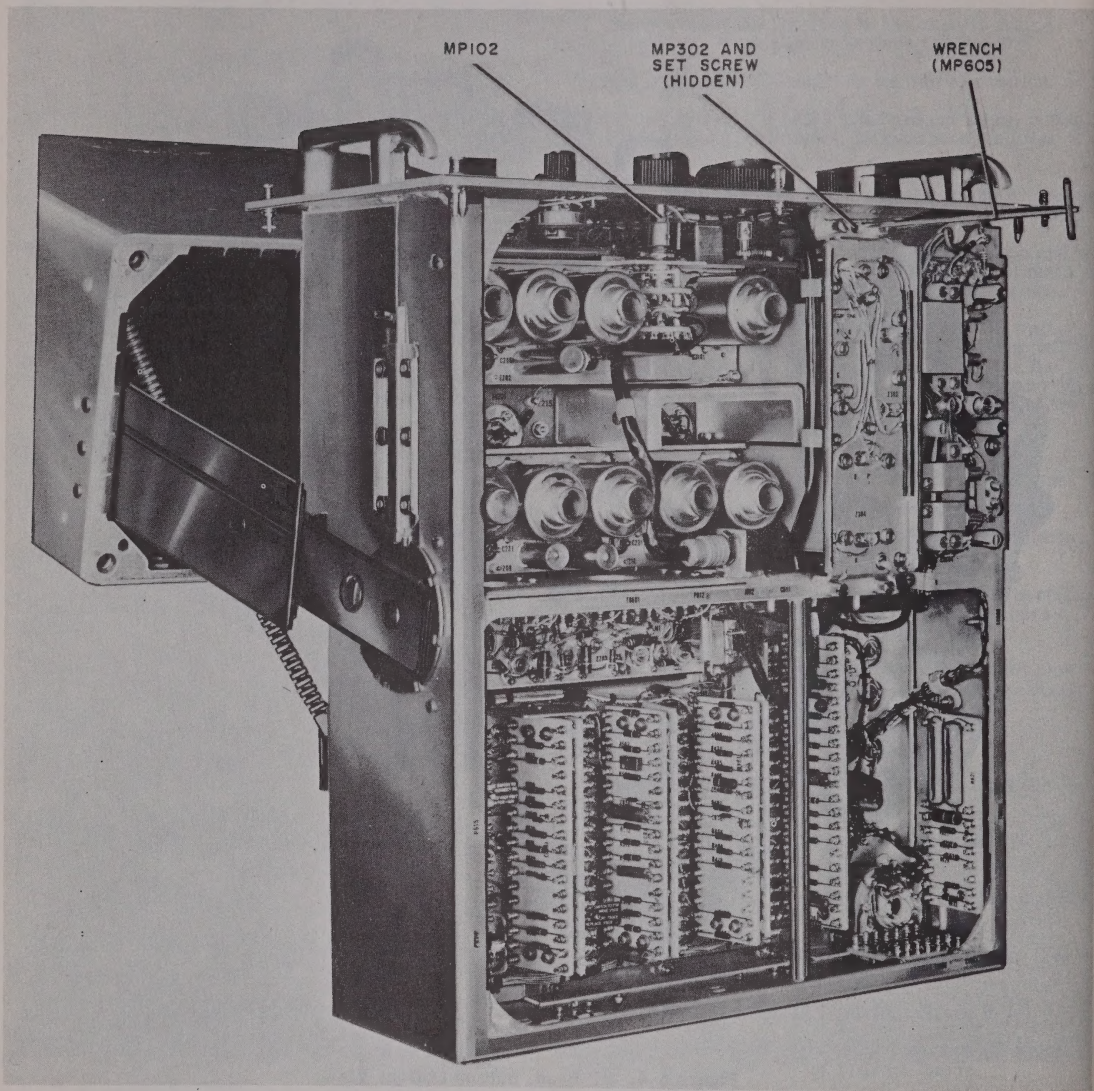


Figure 6-9. Use of Wrench to Remove Shaft Extentions and Knobs

(5) REMOVING NARROW BAND IF FILTERS. (See figure 6-10.) - To remove the narrow band IF filters subassembly, proceed as follows:

Step 1. Set POWER switch to OFF.

Step 2. Withdraw the receiver chassis from the cabinet (see paragraph 6-3a, steps 1 and 2).

Step 3. Disengage plug P301 (see figure 6-7(6)) and pass it through the hole (5) in the chassis frame.

Step 4. Set the BAND WIDTH CPS switch to 120.

Step 5. Rotate the receiver chassis 105 degrees, front panel up.

Step 6. Using the special long handled wrench provided, loosen the set screw (see figure 6-9) securing the BAND WIDTH CPS shaft extension to the BAND WIDTH CPS switch shaft.

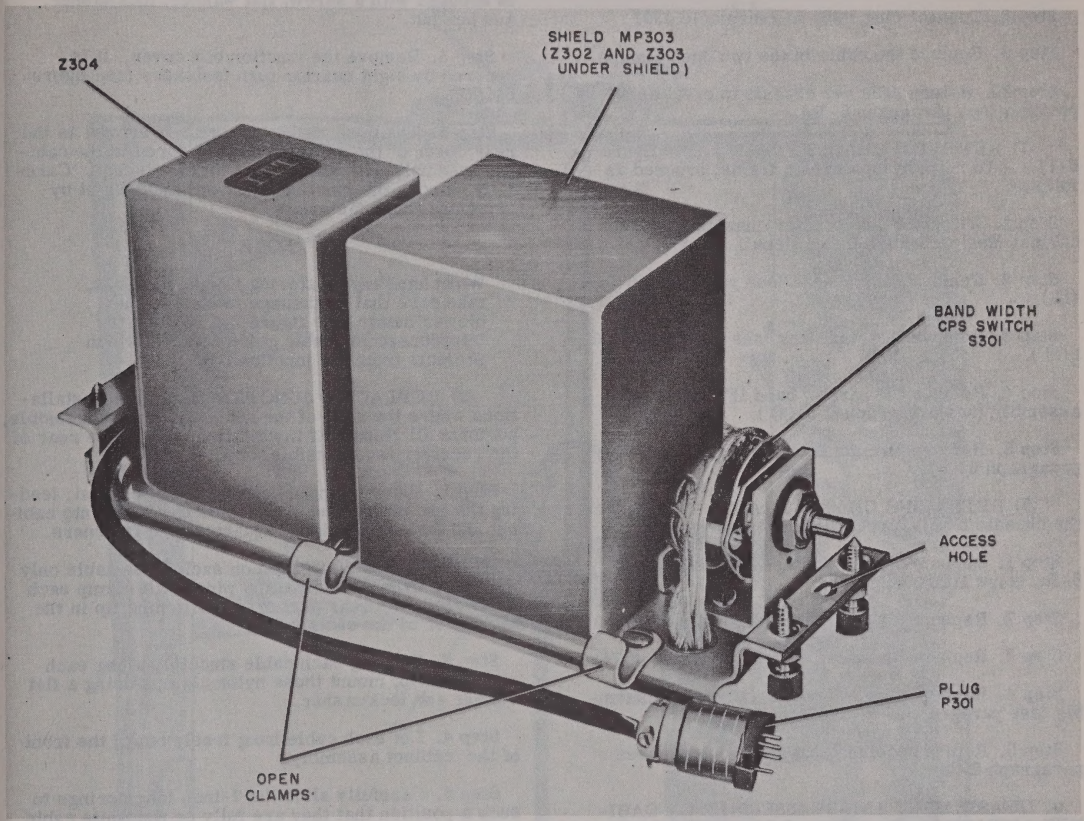


Figure 6-10. Narrow Band IF Filters

NOTE

Access is provided through a cutout in the narrow band IF filters subchassis. Do not loosen the rubber cemented set screw securing the knob to the shaft extension.

Step 7. Pull the BAND WIDTH CPS knob and shaft extension assembly from the front panel.

Step 8. Loosen the four captive screws (see figure 6-1(5)) while carefully supporting by hand the narrow band IF filters subassembly, and remove it from the bottom of the chassis frame. The chassis frame cable along the left side (4) is held in two open clamps (30) and is easily disengaged from the narrow band IF filters subassembly.

Step 9. Set the narrow band IF filters subassembly down in a safe place.

(6) REPLACING NARROW BAND IF FILTERS. - To replace the narrow band IF filters subassembly on the chassis frame, proceed as follows:

Step 1. Set flat of BAND WIDTH CPS switch shaft on narrow band IF filters subassembly parallel to the bottom of the subassembly.

Step 2. Rotate the chassis frame to 105 degrees, front panel up.

Step 3. Pass plug P301 through the hole in the chassis frame.

Step 4. Carefully place the narrow band IF filters subassembly onto the chassis frame. Make sure that it seats properly on the chassis frame and continue supporting it by hand.

Step 5. While supporting the narrow band IF filters subassembly, tighten the four captive screws securely. Do not over tighten.

Step 6. Replace the BAND WIDTH CPS knob and shaft extension assembly on the BAND WIDTH CPS switch shaft then tighten the set screw. Check the three switch positions to verify that knob is installed correctly.

Step 7. Rotate receiver chassis to horizontal position.

Step 8. Connect plug P301 to receptacle J301.

Step 9. Replace the cable in the two open clamps.

Step 10. Return receiver chassis to operational position (see paragraph 6-3b).

(7) REMOVING CHASSIS FRAME. (See figure 6-11.) - To remove the chassis frame, proceed as follows:

Step 1. Withdraw the receiver chassis from the cabinet (see paragraph 6-3a, steps 1 and 2).

Step 2. Remove the RF head (see paragraph 6-5a (1)).

Step 3. Remove the rear deck (see paragraph 6-5 a(3)).

Step 4. Remove the narrow band IF filters subassembly (see paragraph 6-5a(5)).

Step 5. Remove chassis frame from cabinet (see paragraph 6-4a).

(8) REPLACING CHASSIS FRAME. - To replace the chassis frame, proceed as follows:

Step 1. Replace chassis frame (see paragraph 6-3b, steps 1 through 7).

Step 2. Replace RF head (see paragraph 6-5a(2)).

Step 3. Replace rear deck (see paragraph 6-5a(4)).

Step 4. Replace narrow band IF filters subassembly (see paragraph 6-5a(6)).

Step 5. Return receiver chassis to cabinet (see paragraph 6-3b).

b. DISASSEMBLY AND REASSEMBLY OF CABINET ASSEMBLY. (See figure 6-6.) - The cabinet assembly is composed of three subassemblies; the junction box, the cabinet, and part of the slide assembly. The junction box mounts on the rear of the cabinet and the interconnecting cables connecting the junction box to the receiver chassis are clamped to the inside top of the cabinet.

(1) REMOVING JUNCTION BOX. (See figure 6-12.) - To remove the junction box at installations where the rear of the receiver is not accessible, perform all steps below. To remove the junction box at installations where the rear of the receiver is accessible, omit step 2.

Step 1. Remove the receiver chassis (see paragraph 6-4a).

Step 2. Remove the cabinet assembly from the table top (see paragraph 6-4c, steps 3, 4, and 5).

Step 3. Release the two interconnecting cables from the inside top of the cabinet by removing the two metal brackets in the upper front corners of the cabinet, and the eight nylon clamps located in the top of the cabinet. Each bracket is fastened with two screws, lockwashers, and hex nuts; and each clamp is secured with a screw, flat washer, lockwasher, and hex nut.

Step 4. Remove the junction box cover. It is secured by eight quarter turn fasteners (see figure 6-12(2)).

Step 5. The base of the junction box serves as the rear cover of the cabinet and is secured to the cabinet assembly with six quarter turn fasteners. Carefully remove the junction box from the cabinet by loosening these fasteners.

NOTE

When handling or storing the junction box, take care that no damage is done to the blower motor (see figure 2-5(2)) and the interconnecting cable guide cone (1) which projects from the junction box.

(2) REPLACING JUNCTION BOX. - At installations where the rear of the receiver is not accessible, perform all steps. At installations where the rear of the receiver is accessible, omit step 13.

Step 1. Place junction box on rear of cabinet, feeding the two interconnecting cables carefully into cabinet and fasten with the six quarter turn fasteners.

Step 2. Properly position on each loose cable only those two nylon cable clamps which will clamp each cable along the rear part of the stiffening lip in the top center of the cabinet.

Step 3. Feeding each cable smoothly along each stiffening lip, mount these nylon clamps using a flat washer and lockwasher.

Step 4. Let each cable hang freely out of the front of the cabinet assembly.

Step 5. Carefully slide the 7-inch long springs to such a position that they are fully on the white cable duct with the top end of the spring exactly flush with the top end of the top cable duct.

Step 6. Slide and twist the metal brackets on each 7-inch long spring so that the top end of each bracket is flush with the top end of the spring, which in turn is flush with the top end of the cable duct. On the right hand cable the ear on the bracket should point toward the right; on the left hand cable the ear should point to the left.

Step 7. Working with the right hand cable only, press the top end of the bracket, spring and cable duct, against the cable using the forefinger and thumb of the left hand; and with the right hand loop the right cable in a counterclockwise manner and feed it back along the right hand side of the cabinet so that the 7-inch long spring lies along the top right hand edge of the cabinet.

Step 8. Force the bracket with its wing now pointing to the left (with the bracket, spring and cable duct ends all in line) into the top, right, front corner of the cabinet. Bend the cable itself sharply if necessary to get the bracket mounting holes in line with

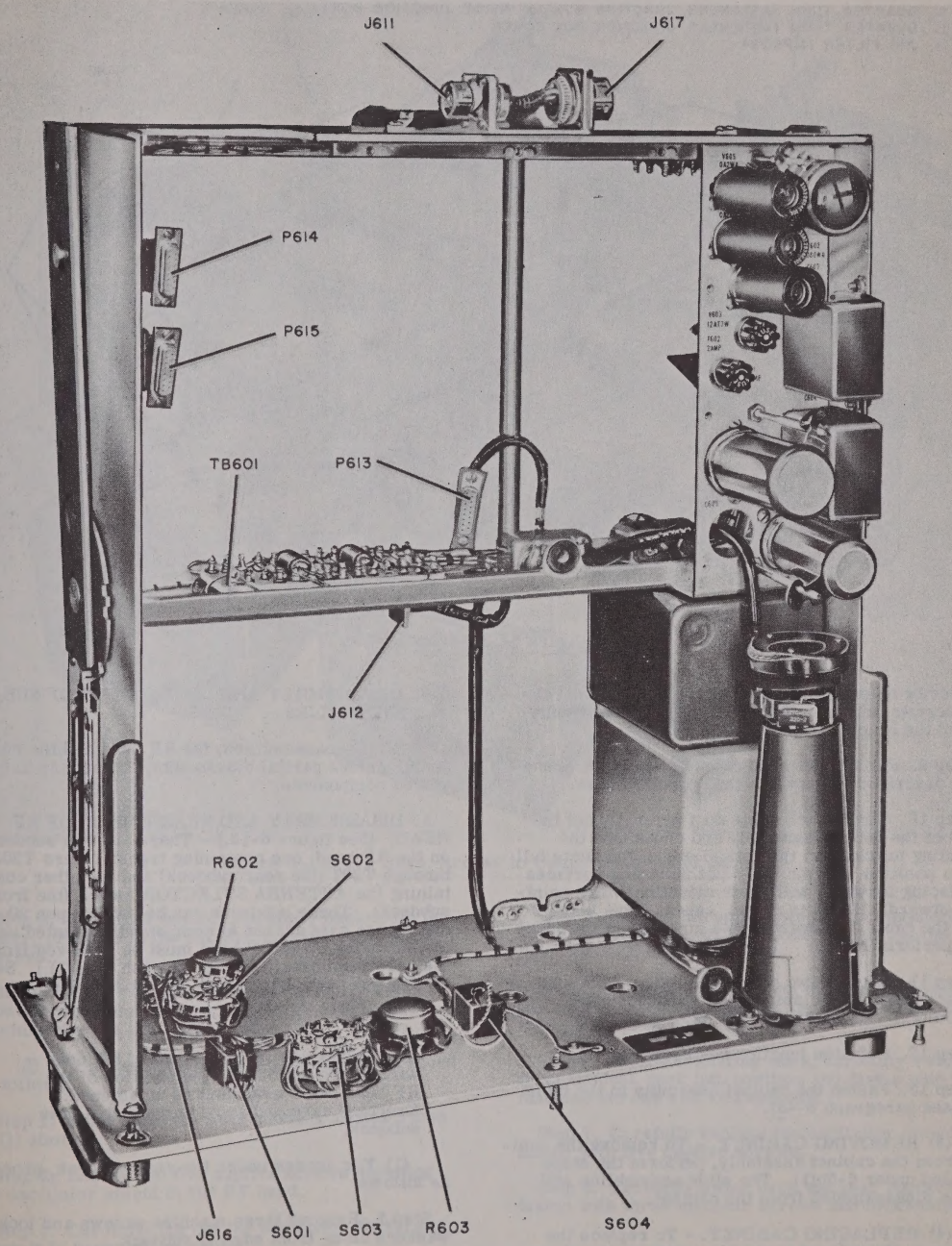


Figure 6-11. Chassis Frame, Subunits Removed

1. QUARTER TURN FASTENERS, JUNCTION BOX (* INSIDE JUNCTION BOX)
2. QUARTER TURN FASTENERS, JUNCTION BOX COVER
3. AIR FILTER (MP608)

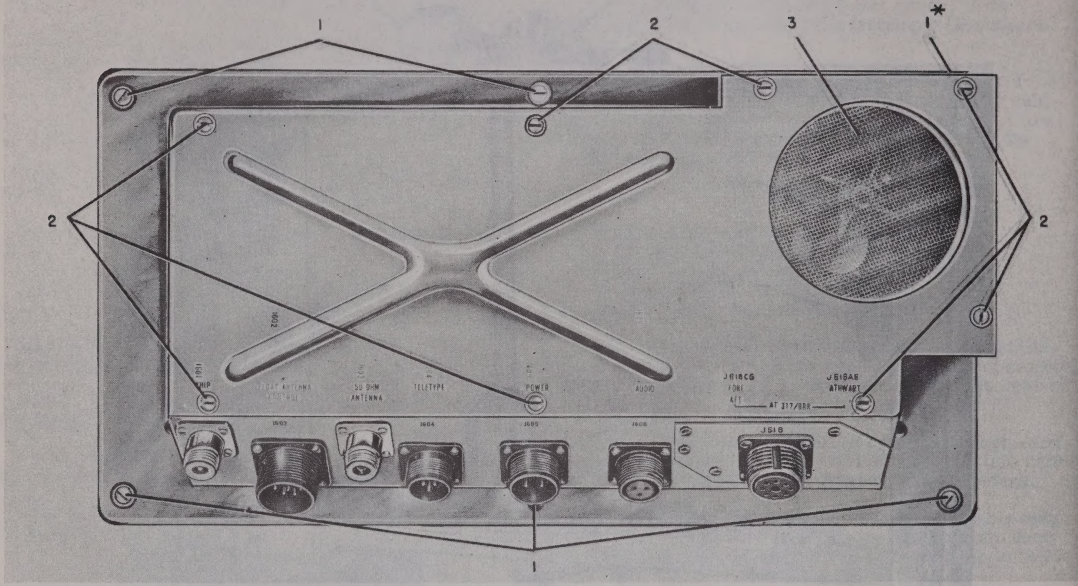


Figure 6-12. Junction Box

the screw holes in the top of the cabinet. Insert the two screws, and using lockwashers and nuts firmly fasten the bracket to the cabinet.

Step 9. For the left hand cable perform the procedure described in step 8 in the opposite sense.

Step 10. Circle each cable duct naturally out the front of the cabinet assembly and check that the mounting brackets at the bottom end of the ducts fall into a position wherein their flat mounting surfaces are facing forward, with their mounting wings pointing outward. If this is not so, repeat steps 8 and 9 with the cable duct twisted into a position to produce this performance.

Step 11. Add the two remaining nylon cable clamps on each cable, and clamp the rest of each cable smoothly to the top of the cabinet.

Step 12. Refasten junction box cover.

Step 13. Fasten the cabinet assembly to the table top (see paragraph 6-4d).

(3) REMOVING CABINET. - To remove the cabinet from the cabinet assembly, perform the steps detailed under 6-5b(1). The slide assemblies will not be disassembled from the cabinet.

(4) REPLACING CABINET. - To replace the cabinet in the cabinet assembly, perform the steps detailed under 6-5b(2).

6-6. DISASSEMBLY AND REASSEMBLY OF SUBASSEMBLIES.

Two subassemblies, the RF head and the rear deck, require partial disassembly for access to concealed components.

a. DISASSEMBLY AND REASSEMBLY OF RF HEAD. (See figure 6-13.) - There are two subdecks on the RF head one containing transformers T203 through T207 (the rear subdeck) and the other containing the ANTENNA SELECTOR switch (the front subdeck). These subdecks can be swung open 90 degrees to gain access to components mounted under the subdecks. The RF head must be removed from the receiver chassis (see paragraph 6-5a(1)). Set the RF head on a bench with transformers up.

CAUTION

Avoid unnecessary movement of RF head wiring. Do not change the position of the RF head while a subdeck is unfastened. Exercise care and avoid damage to a free subdeck.

(1) For access under the rear subdeck, proceed as follows:

Step 1. Remove three machine screws and lockwashers along front edge of subdeck.

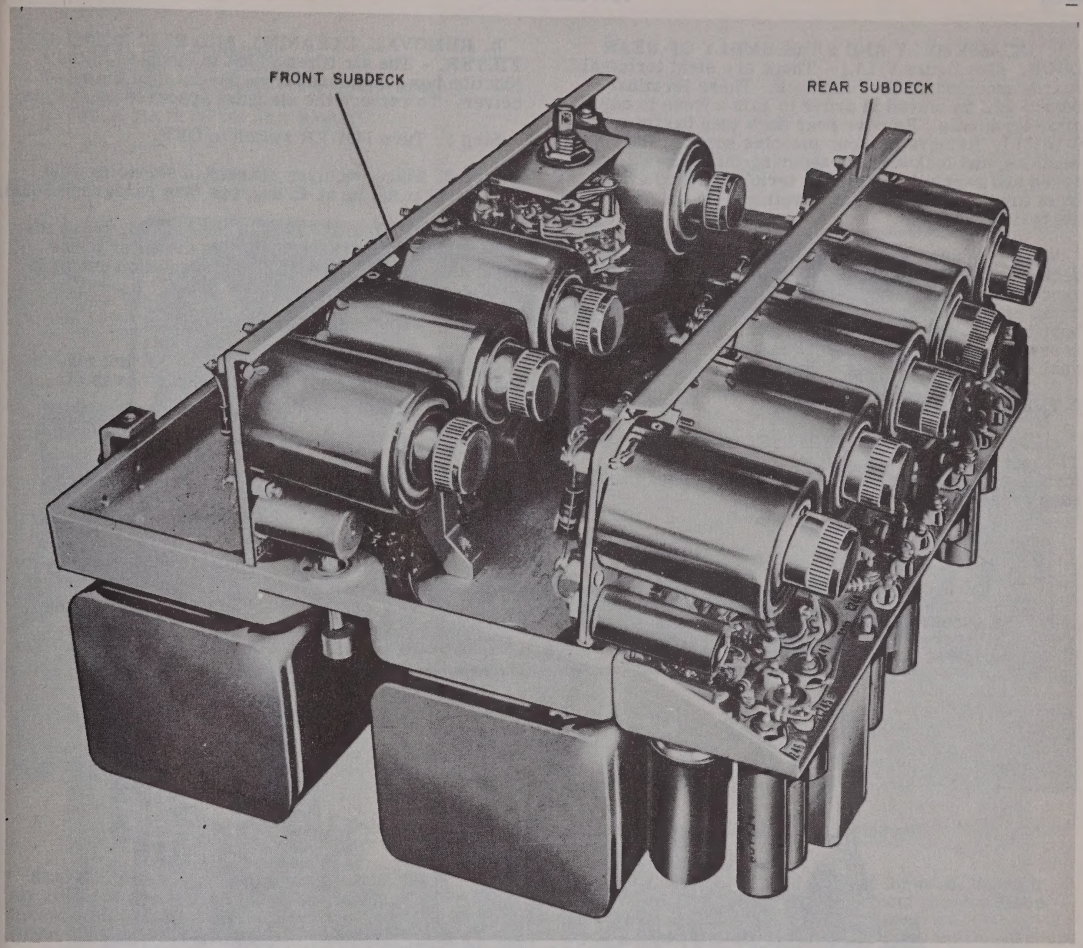


Figure 6-13. RF Head, Access to Components Under Subdecks

Step 2. Swing the subdeck carefully back from the center, pivoting on the outside, approximately 90 degrees.

Step 3. After completing work, carefully swing subdeck back into position and fasten with three machine screws and lockwashers.

(2) For access under the front subdeck, proceed as follows:

Step 1. Swing open the rear subdeck as described in (1) above.

Step 2. Loosen the five captive screws securing the oscillator shield to the RF head.

Step 3. Carefully lift out the oscillator shield and allow it to hang from a cable.

Step 4. Remove three screws and lockwashers along the front edge of the subdeck securing the front subdeck to the RF head.

Step 5. Carefully swing open the front subdeck from the outside, pivoting on the inside, to an approximate 90 degree position.

Step 6. After completing work, carefully swing front subdeck back into position and fasten with three machine screws and lockwashers.

Step 7. Carefully replace the oscillator shield and fasten with five captive screws.

Step 8. Carefully swing back the rear subdeck and fasten with three machine screws and lockwashers.

b. DISASSEMBLY AND REASSEMBLY OF REAR DECK. (See figure 6-14.) - There are eight terminal boards mounted on the rear deck. These terminal boards can be moved in order to gain access to capacitor terminals. Remove rear deck (see paragraph 6-5a(3)). Remove the four machine screws, flat washers, and lockwashers securing the terminal board and carefully rotate the terminal board away from the mounting bracket, pivoting it on the side nearest the chassis.

When replacing the terminal boards on the rear deck, carefully rotate them back into place; carefully check that no wires are clamped between terminal board and mounting brackets; and fasten terminal board to mounting brackets using the four machine screws, flat washers, and lockwashers. Replace rear deck (see paragraph 6-5a(4)).

6-7. REPLACING PARTS.

a. TEST EQUIPMENT AND SPECIAL TOOLS. - The test equipment and special tool required to perform the replacement procedures are detailed under each procedure.

b. REMOVAL, CLEANING, AND REPLACING AIR FILTER. - The air filter which is mounted in the junction box is removed from the front of the receiver. To remove the air filter, proceed as follows:

Step 1. Turn POWER switch to OFF.

Step 2. Place receiver chassis in servicing position, front panel up at 45 degrees (see paragraph 6-3a).

Step 3. Reach to the rear of the cabinet, grasp the ring handle of the filter, and slide air filter to the right and lift out. Note that the indentation cutout in handle is facing you (see figure 6-15(3)).

Step 4. Remove the heavy, loose dust.

Step 5. Soak air filter in approved solvent for approximately 1/2 hour. Use brush and swab air filter free of all dust and old oil.

Step 6. Dry thoroughly.

Step 7. Dip air filter in either SAE 30, 40, or 50 lubricating oil. Shake off excess and drain for 10 minutes, air inlet down. Wipe oil off filter frame and ring.

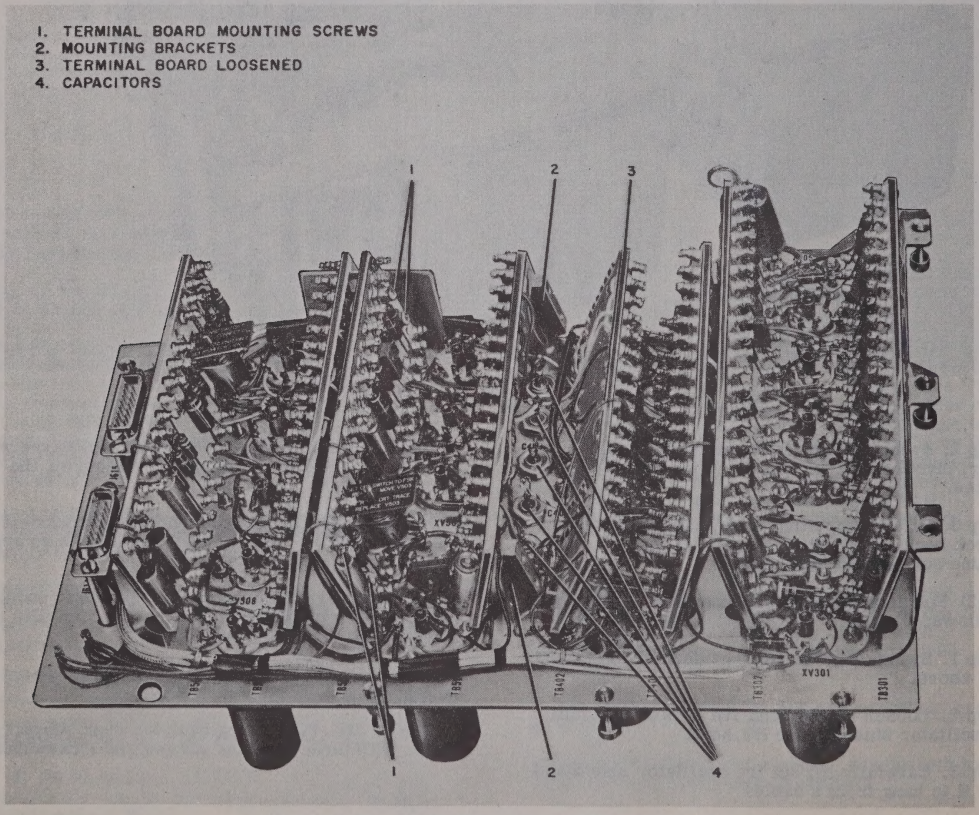


Figure 6-14. Rear Deck, Terminal Board Loosened

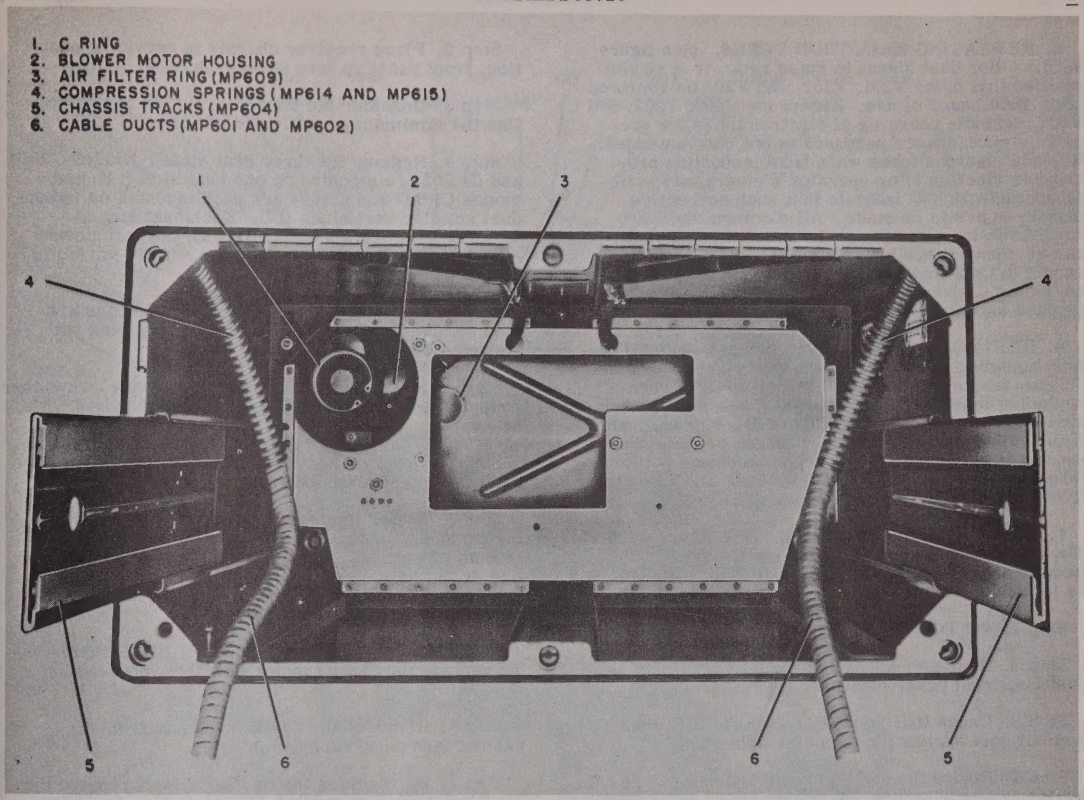


Figure 6-15. Cabinet Interior, Interconnecting Cable Guide Cone Removed.

Step 8. Replace air filter. To do this, insert the air filter in the cutout in the rear of the cabinet with indentation in handle facing you, and slide the air filter directly left until it seats properly in the recess.

Step 9. Return receiver chassis to operational position (see paragraph 6-3b).

c. REPLACING CATHODE RAY TUBE INDICATOR. (See figure 6-7.) - To replace the cathode ray tube indicator (crt), proceed as follows:

Step 1. Set POWER switch to OFF.

Step 2. Place the receiver chassis in the horizontal servicing position (see paragraph 6-3a).

Step 3. Remove base plug (8) from crt (13). Note that the key on the crt base is down.

Step 4. Open clamp (9) on neck of crt.

Step 5. Remove crt bezel (12) from front panel. This is secured by two Phillips head screws.

Step 6. Carefully push the crt forward, through the shield (10), out through the front panel. Place crt in safe place.

Step 7. Insert new crt through front panel into shield. Position crt with base key down.

Step 8. Carefully connect the base plug to the base of the crt, holding the face of the crt so that it will not come out of the front panel.

Step 9. Turn POWER switch to ON with CRT switch to SET LEVEL, AGC-MAN switch to MAN, and RF GAIN MAN control fully counterclockwise. Rotate crt until trace is horizontal.

Step 10. Set POWER switch to OFF.

Step 11. Refasten bezel to front panel with two Phillips head screws.

Step 12. Refasten clamp on neck of crt.

Step 13. Return receiver chassis to operational position (see paragraph 6-3b).

d. REPLACING ELECTRON TUBES. (See figure 6-16.) - For best signal to noise ratio, it is recommended that tubes V201, V202, and V203 be replaced after 2000 hours of use. Except for V201, V202, and V203, periodic changing of electron tubes for preventive maintenance purposes is not recommended. Replace electron tubes when troubleshooting procedures (Section 5) or operator's emergency maintenance (Section 3) indicate that such corrective measures are to be made. All electron tubes are accessible from the top of the receiver chassis and can be changed easily and quickly. Set POWER switch to OFF and place the receiver chassis in a servicing position (see paragraph 6-3a). Always replace an electron tube with the same type.

e. REPLACING FUSES. (See figure 6-16.) - The fuse holders are located on the top, right side of the chassis frame. Set POWER switch to OFF when replacing fuses. Always replace fuses with the same slow-blow type and rating (Buss MDL 2 or equivalent). If the replaced slow-blow fuse blows, replace it a second time. If the second replacement slow-blow fuse blows, set POWER switch to OFF and refer to troubleshooting procedures (Section 5).

f. REPLACING DIAL LIGHTS. (See figure 6-16.) - The dial lights are accessible from the rear of the front panel. To replace either dial light, proceed as follows:

Step 1. Set POWER switch to OFF.

Step 2. Replace receiver chassis in servicing position, front panel down (see paragraph 6-3a).

Step 3. Check that POWER switch is OFF; then with a small screwdriver, loosen dial light clip.

Step 4. Rotate the dial light clip and replace defective lamps with new AN-327 lamps or equivalent.

Step 5. Rotate the dial light clip back into position, seating the hole in the dial light clip on the base of the lamp.

Step 6. Tighten the dial light clip screw, making sure that the dial light clip seats properly on the melamine shouldered insulator.

Step 7. Set POWER switch to ON and note if the dial lights are lit.

Step 8. Set POWER switch to OFF and return receiver chassis to the operational position (see paragraph 6-3b).

g. REPLACING SEMICONDUCTOR RECTIFIERS CR601 THROUGH CR604. (See figure 6-1.) - Semiconductor power rectifiers are extremely reliable devices; they do not fail under normal operating conditions. If tests have indicated a shorted rectifier, this means a short circuit has been placed on the CR601, CR602 junction point or on the CR603, CR604 junction point. Be sure to locate and clear this short circuit before replacing rectifiers (for example filter capacitors C604 or C607 may be shorted). To replace the semiconductor rectifiers, diodes CR601 through CR604, proceed as follows:

Step 1. Set POWER switch to OFF.

Step 2. Place receiver chassis in servicing position, front panel up (see paragraph 6-3a).

Step 3. Unsolder the lead from the tip of the diode. Use the minimum possible amount of heat.

Step 4. Remove the three heat sinks. Diodes CR601 and CR602 are mounted on one heat sink (14), and diodes CR603 and CR604 are each mounted on individual smaller heat sinks (17). Each heat sink is fastened to two nylon standoffs with two machine screws and lockwashers. Remove screws carefully. Do not bend heat sink.

Step 5. Remove the defective diode. Diodes are stud mounted and are secured to the heat sink with a nut and lockwasher.

Step 6. Install new diode and secure with lockwasher and nut. Do not use insulated washers supplied with new diode.

Step 7. Refasten heat sink on nylon standoffs with two machine screws and lockwashers.

Step 8. Solder the lead removed in step 3 back to the tip of the diode. Use the minimum possible amount of heat.

Step 9. Return receiver chassis to operational position (see paragraph 6-3b).

h. REPLACING BLOWER MOTOR BEARINGS. - To replace the blower motor bearings, proceed as follows:

Step 1. Remove the receiver chassis from the cabinet (see paragraph 6-4a).

Step 2. By reaching inside the cabinet, remove the air filter (see paragraph 6-7b).

Step 3. By reaching inside the cabinet, remove the interconnecting cable guide cone from the blower motor housing by pulling forward (see figure 2-5(1)). Note the cutout is down.

Step 4. At installations where the junction box is not accessible, remove the cabinet assembly from the table top (see paragraph 6-4c). If the junction box is accessible, proceed to step 5.

Step 5. At the rear of the cabinet, remove the junction box cover. It is secured with eight quarter turn fasteners (see figure 6-12).

Step 6. Remove the blower fan blade (see figure 6-17(6)). It is secured by two Allen head set screws (5).

Step 7. Working inside the cabinet, remove the large C ring (see figure 6-15(1)) from the blower motor housing (2) with a Waldes Truarc plier No. 4.

Step 8. Carefully remove the motor rotor assembly and end cap through the front of the motor housing. Pressure will have to be applied to the rear (fan blade end) of the shaft.

Step 9. Remove the spring washers and grease cup from the fan blade end of the motor.

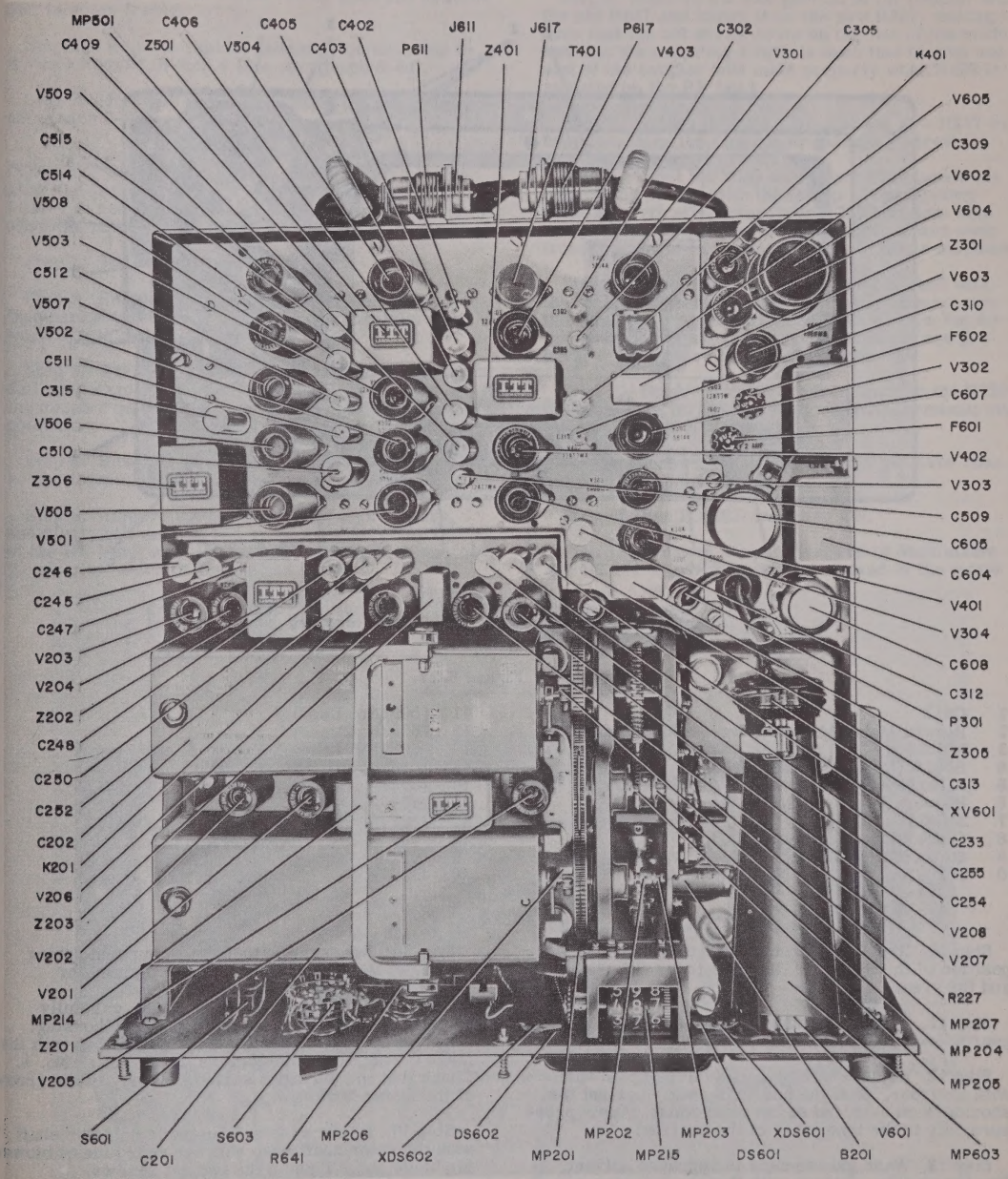


Figure 6-16. Receiver Chassis, Top View, Parts Location

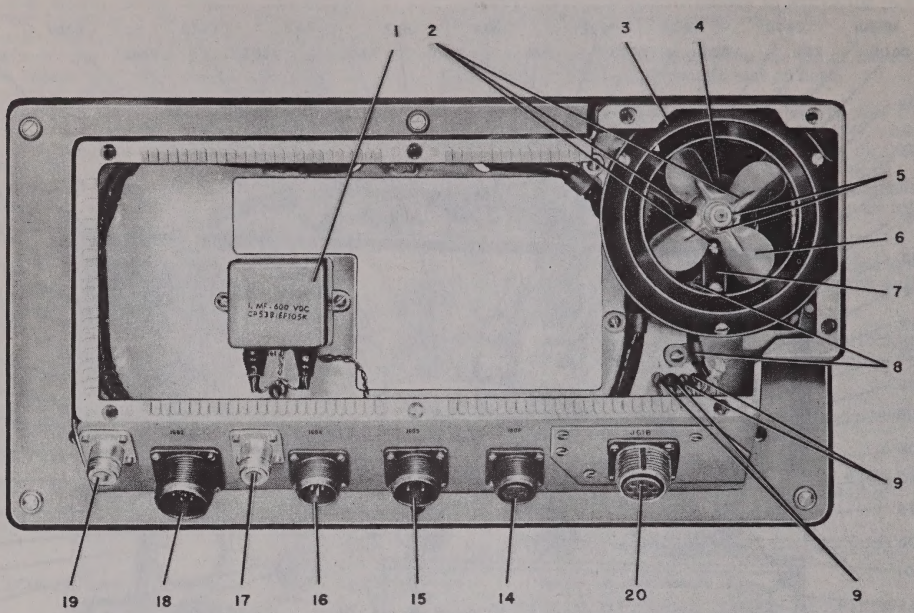


Figure 6-17. Junction Box, Cover Removed

Legend for Figure 6-17.

1	C612	
2	Blower Motor Mounting Screws (One Hidden)	
3	MP622	B601
4	B601A (MP618 and MP619)	B601
5	Allen Head Set Screws	B601
6	Blower Fan Blade (MP623)	B601
7	MP621	B601
8	Cable Clamps	
9	Standoff Terminals	
10	J610 (Not Used)	
11	J609 (Not Used)	
12	J608 (Not Used)	
13	J607 (Not Used)	
14	J606	
15	J605	
16	J604	
17	J603	
18	J602	
19	J601	
20	J618	

Step 10. Remove the rotor from the end cap. Note position of the thin fiber disk, the three flat plates, and the grease cup.

Step 11. Remove bearings from rotor shaft with a gearpuller.

Step 12. Replace new bearings on the rotor shaft with an arbor. Seat the bearings snugly against the shoulders on each end of the rotor shaft. Apply pressure only to the inner ring of the bearing.

Step 13. Wash grease cups in approved solvent. Dry thoroughly. Repack with Beacon 3u5 grease per MIL-G-3278.

Step 14. Reassemble the thin fiber disk, three flat plates, and grease cup in the end cap and push the end cap on the front bearing.

Step 15. Reassemble the grease cup and spring washer to the fan blade end of the commutator.

Step 16. Working inside the cabinet, carefully replace the rotor assembly in the motor housing. Seat it properly and secure it to the housing with th large C ring, using the Waldes Truarc plier No. 4. Check that the C ring is seated properly in the groo of the motor housing.

Step 17. Replace blower fan blade on rotor shaft with the rotor shaft even with the rear side of blow fan blade hub. Tighten the two set screws.

Step 18. Replace interconnecting cable guide con with cutout down.

Step 19. Replace air filter.

Step 20. Spin blower motor fan by hand and observe that is spins freely.

Step 21. Replace cabinet assembly on table top if it was removed in step 4 (see paragraph 6-4d).

Step 22. Replace receiver chassis in cabinet (see paragraph 6-4b).

i. REPLACING AND ALIGNING FREQUENCY GAIN CONTROL R227. (See figures 6-16 and 6-18.) - To align the frequency gain control, Multimeter AN/PSM-4 is required. To replace damaged R227 and to align the new unit, proceed as follows:

Step 1. Set POWER switch to OFF.

Step 2. Remove RF head from receiver chassis (see paragraph 6-5a(1)) and place it carefully on work bench, gear side up.

Step 3. Turn RF TUNING shaft to make counter dial read exactly 14.0 kc. Note that pin and slot of the coupler on the shaft of R227 are in horizontal position.

Step 4. Unsolder and carefully tag the wires on the solder terminals of R227 (see figure 6-18(5)).

Step 5. Remove the three screws, lockwashers, and cleats (4), and the one ground lug securing R227 to the RF head, and lift out R227 and the slot part of the coupler which is fastened to its shaft.

Step 6. Remove the slot portion of the coupler from the old R227 and mount it on the new R227, making sure that the set screw seats on the flat of the shaft and that the mounting length is such that the pin and slot of the coupler will mate properly when R227 is mounted on the RF head.

Step 7. Loosen the ring clamp on the new R227 by fully loosening the ring clamp clamping screw (3).

Step 8. Twist the body of the new R227 inside its ring clamp so that with the clamp screw opening pointing vertically upward, the R227 terminal lugs are pointing 45 degrees from the vertical and away from the synchro transmitter when R227 is mounted.

Step 9. Mount the new R227 to the RF head with the clamping screw opening vertically upward; use the three screws, lockwashers, cleats and a lug for this purpose. Make sure that slot and pin are properly mated before tightening screws.

Step 10. Solder the three tagged leads to the R227 terminal lugs (green-orange to the CW terminal; red-blue-white to the S terminal).

Step 11. Return the RF head to the receiver chassis (see paragraph 6-5a(2)).

Step 12. Set POWER switch to ON.

Step 13. Connect the positive lead of Multimeter AN/PSM-4 to ground the negative lead of the meter

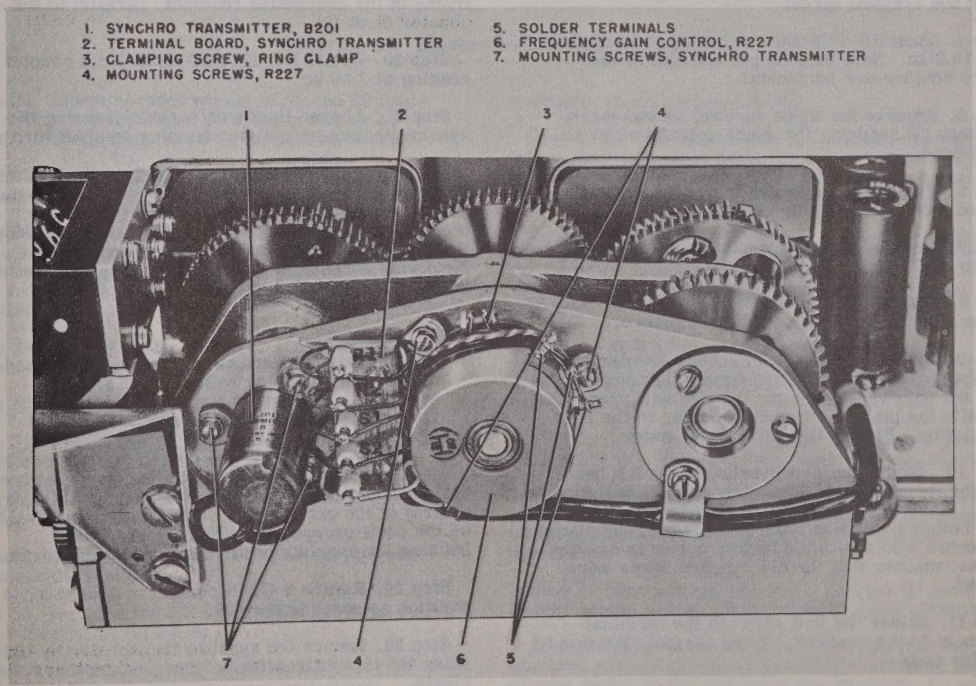


Figure 6-18. Replacing Frequency Gain Control and Synchro Transmitter

to the S terminal of R227. Check that the FREQ. dial still reads 14.0 kc, and that the ring clamp is still loose on the body of R227. Now carefully rotate body of R227 to produce a reading of 2.5 volts on the multimeter.

Step 14. Set POWER switch to OFF.

Step 15. Disconnect multimeter and carefully tighten ring clamp without moving body of R227.

j. REPLACING AND ALIGNING SYNCHRO TRANSMITTER B201. (See figures 6-16 and 6-18.) - In the following procedure Oscilloscope OS-8A/U (oscilloscope), Variac type V5 manufactured by General Radio Company, Cambridge, Mass., Electronic Multimeter ME-6B/U (ac vtvm), or equivalents are required. A test cable having a Cannon Connector type DA-15S (with a standard junction shell 19678-1), and a toggle switch, and also a 400 cps supply (see figure 6-19) are required.

To replace the synchro transmitter, proceed as follows:

Step 1. Turn POWER switch to OFF.

Step 2. Remove RF head from receiver chassis (see paragraph 6-5a(1)).

Step 3. Unsolder the five synchro wires from the terminal board (see figure 6-18(2)) mounted next to the synchro. Note the length, dress, and color code of the synchro wires.

Step 4. Turn RF TUNING shaft until counter dial reads 14.0 kc. Note that the pin and slot of the synchro coupler are horizontal.

Step 5. Remove the three screws, lockwashers, and cleats (7) securing the synchro transmitter to the RF head.

Step 6. Pull out the synchro transmitter and the attached slot part of the coupler.

Step 7. Remove the slot coupler from the old synchro shaft.

Step 8. Cut the leads on the new synchro to exactly the same length as those on the old synchro.

Step 9. Place the slot portion of the coupler on the new synchro shaft, and before firmly tightening the single set screws, make sure the slot will properly mate with the pin portion of the coupler in the RF head casting. Firmly tighten this set screw.

Step 10. Secure the new synchro to the RF head using the three screws, lockwashers, and mounting cleats. Make sure the slot and pin are properly mated before tightening the three screws, and clamp the synchro wires with the bottom screw in exactly the same manner that the old synchro wires were clamped.

Step 11. Solder the five wires to the terminal board next to the synchro, paying careful attention to the color code.

Step 12. Connect test setup as shown in figure 6-19.

CAUTION

Do not turn on the 400 cps power at this time. Do not connect test cable connector plug P1 to receptacle J613.

Step 13. Set variac dial for 5 volt indication.

Step 14. Turn on 400 cps power supply and adjust variac for 5 vac as observed on ac vtvm.

Step 15. Check and adjust the in-phase oscilloscope pattern by temporarily removing the test cable wire from the Y INPUT terminal of the oscilloscope and connecting a jumper wire between the Y INPUT and the X INPUT terminals, and by adjusting the Y GAIN, X GAIN, Y POSITION, and X POSITION controls for a full scale pattern (see figure 6-19). Note the inclination of the straight line Lissajous figure. This is the in-phase condition.

Step 16. Remove the jumper wire and connect the test cable wire remove in step 15.

Step 17. Connect the test cable connector plug P1 to connector receptacle J613 on the RF head.

Step 18. Close switch A (see figure 6-19).

Step 19. With a marking crayon, mark a temporary centerline (see figure 6-20(4)) across the face of the counter chassis (3) (which normally butts up against the counter bezel located on the chassis frame in the assembled receiver) parallel to the counter shaft (9).

Step 20. Rotate RF TUNING shaft for a counter reading of 22.0 kc.

Step 21. Loosen the three screws securing the synchro transmitter stator housing one half turn.

Step 22. Rotate the stator housing to the true null. Rotation of the stator housing will produce two nulls, 180 degrees apart. The nulls are identified as horizontal lines or ellipses approaching horizontal lines. The true null is identified when further clockwise rotation of the stator housing results in the in-phase pattern observed in step 15.

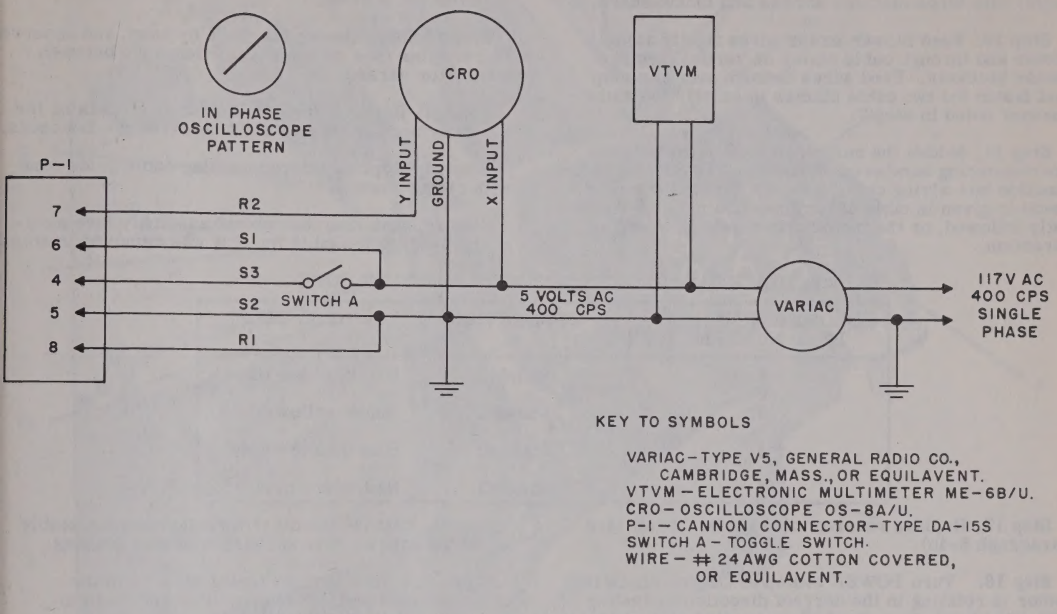
NOTE

The in-phase pattern resulting from rotation of the stator housing will not be a simple straight line. It will be an ellipse and will rotate longitudinally in the direction described above.

Step 23. Adjust the stator housing for exact true null position by noting the position of the Y GAIN control of the oscilloscope; increasing the Y GAIN on the oscilloscope; and adjusting the stator housing for absolute minimum vertical deflection.

Step 24. Return Y GAIN control of oscilloscope to position as noted in step 23.

Step 25. Secure the synchro transmitter by tightening the three mounting screws, lockwashers, and cleats.



KEY TO SYMBOLS

VARIAC – TYPE V5, GENERAL RADIO CO., CAMBRIDGE, MASS., OR EQUILAVENT.
VTVM – ELECTRONIC MULTIMETER ME-6B/U.
CRO – OSCILLOSCOPE OS-8A/U.
P-1 – CANNON CONNECTOR – TYPE DA-15S
SWITCH A – TOGGLE SWITCH.
WIRE – # 24 AWG COTTON COVERED, OR EQUILAVENT.

Figure 6-19. Synchro Transmitter Test Setup

Step 26. Check correct wiring of S1 and S2 leads of the synchro transmitter by opening switch A. The oscilloscope must show an in-phase pattern.

Step 27. Close switch A and check the synchro transmitter null by performing steps 28 through 31.

Step 28. Rotate RF TUNING shaft counterclockwise so that the counter moves from 22.0 kc toward lower frequency readings. The true null pattern will rotate from the horizontal trace towards the in-phase indication.

Step 29. Rotate the RF TUNING shaft clockwise returning the counter to 22.0 kc.

Step 30. Observe the true null, horizontal pattern.

Step 31. Rotate the RF TUNING shaft clockwise so that the counter moves from 22.0 kc toward higher frequency readings. The true null pattern will rotate away from the horizontal position and the in-phase position.

Step 32. Turn off the 400 cps power supply, and disconnect the test setup.

Step 33. Replace the RF head in the receiver chassis (see paragraph 6-5a(2)).

k. REPLACING BLOWER MOTOR B601A. - To replace the blower motor, proceed as follows:

Step 1. Remove receiver chassis from cabinet assembly (see paragraph 6-4a).

Step 2. By reaching inside the cabinet, remove the interconnecting cable guide cone (see figure 2-5(1)) from the front of the blower motor housing by pulling forward. Note that the cutout is down.

Step 3. At installations where the junction box is not accessible, remove the cabinet assembly from the table top (see paragraph 6-4c). At installations where the junction box is accessible, proceed to step 4.

Step 4. At the rear of the cabinet remove the junction box cover which is secured to the junction box with eight quarter turn screws. The air filter will remain in its guide.

Step 5. Remove the blower fan blade (see figure 6-17 (6)) which is secured by two Allen head set screws (5).

Step 6. Unsolder the blower motor leads from the standoff terminals (9). Note that the marker numbers on the motor leads correspond to the terminal numbers.

Step 7. Note how the two cable clamps (8) hold the blower motor wires. Remove these cable clamps.

Step 8. Remove blower motor by removing the three machine screws (2) and lockwashers fastening the blower motor to the blower motor bracket. Do not remove the screws holding the venturi and motor mounting bracket to the junction box.

Step 9. Fasten new blower motor into place on the blower motor bracket (blower motor leads to the right) with three machine screws and lockwashers.

Step 10. Feed blower motor wires tightly along motor and through cable clamp on vertical leg of motor brackets. Feed wires through second clamp and fasten the two cable clamps in exactly the same manner noted in step 7.

Step 11. Solder the numbered blower leads to the corresponding numbered standoffs. The corresponding junction box wiring color code for the blower motor leads is given in table 6-1. This code must be carefully followed, or the motor may rotate in wrong direction.

Step 12. Replace the fan blade with shaft even with rear side of fan blade hub, and secure it to the shaft with two set screws.

Step 13. Spin blower fan blade by hand, and observe that it spins free with adequate clearance between it and motor wires.

Step 14. Replace junction box cover containing the air filter and fasten with eight quarter turn fasteners.

Step 15. Replace interconnecting cable guide cone with cutout down.

Step 16. Refasten the cabinet assembly (see paragraph 6-4d) to the table top if it was removed in step 3.

TABLE 6-1. BLOWER MOTOR LEAD COLOR CODE

BLOWER MOTOR LEAD NUMBER	CONNECTION	COLOR CODE
1	Standoff	Black-green-white
2	Standoff	White-yellow-black
3	Standoff	Blue-brown-white
4	Standoff	Red-white-blue

Step 17. Replace receiver chassis in cabinet (see paragraph 6-4b).

Step 18. Turn POWER switch to ON and check that motor is rotating in the correct direction by testing with your hand, or a sheet of paper, that air is being pulled into the filter-opening and pushed out of side-openings in cabinet.

1. REPLACING BEAD CHAIN MP216. - To replace a broken bead chain, proceed as follows:

Step 1. Place receiver chassis in horizontal servicing position (see paragraph 6-3a).

Step 2. Rotate the RF TUNING knob counterclockwise to the limit stop.

Step 3. Remove RF head (see paragraph 6-5a(1)).

Step 4. Mark a temporary centerline (see figure 6-20(4)) across the face of the counter chassis (3) (which normally butts up against the counter bezel on the front panel of the chassis frame in an assembled receiver) parallel to the counter shaft (9).

Step 5. Turn the counter sprocket gear (10) to make the counter read 13840 ± 20 cps.

Step 6. Remove the bead chain tension spring (11) which is secured to the counter assembly mounting bracket by two machine screws, flat washers, and lockwashers.

Step 7. Remove the counter drive front bearing plate (5).

Step 8. Unloosen (do not remove) the top, right counter assembly mounting screw (2); that is, the one farthest from the counter sprocket gear.

Step 9. Remove the other three counter assembly mounting screws, flat washers, and lockwashers.

Step 10. Check that the tuning shaft is in the extreme counterclockwise position, and that the counter still reads 13840 ± 20 cps.

Step 11. Hang the new bead chain (7) on the counter sprocket gear.

Step 12. Pivot the counter assembly downward with the new bead chain hanging from it. Then, feed the chain onto the lower driving sprocket with a quarter twist so that when viewed from the front, that part of the chain which feeds down over the front of the counter sprocket is fed to the left side of the lower driving sprocket as shown in figure 6-20.

Step 13. Pivot the counter assembly back into place and replace the three counter assembly mounting screws, lockwashers and flat washers. Then while pulling upward on the counter assembly so as to slightly stretch the bead chain, firmly tighten all four machine screws.

Step 14. Check that the counter sprocket did not turn during step 13 and that the counter still reads 13840 ± 20 cps when the RF TUNING shaft is turned firmly against the counterclockwise limit stop.

Step 15. Replace front counter drive bearing plate.

Step 16. Refasten bead chain tension spring on counter assembly mounting bracket using two machine screws, flat washers and lockwashers.

Step 17. Rotate tuning shaft to its extreme clockwise position against its limit stop. The counter reading should be 30450 ± 100 cps. If not, repeat the entire procedure from step 5.

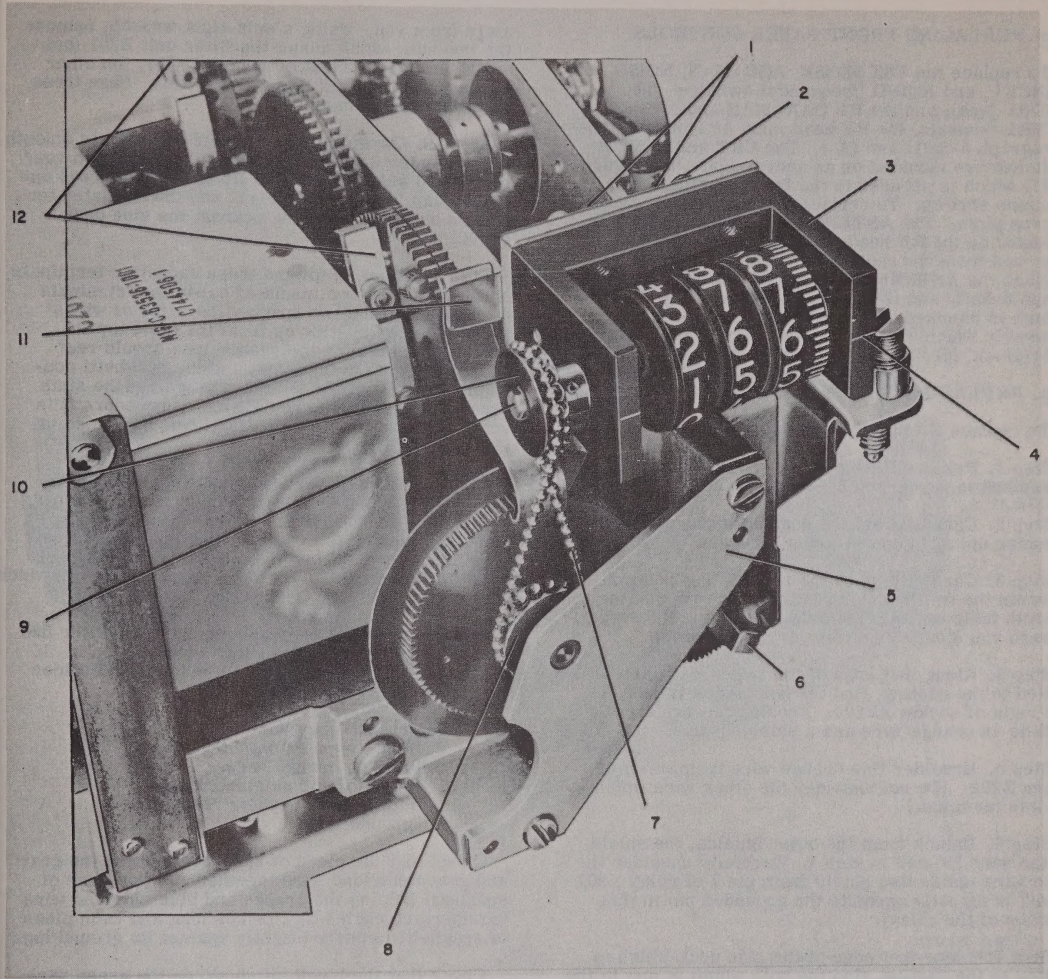


Figure 6-20. Replacing Bead Chain

Legend for Figure 6-20.

1 Mounting Screws (Hidden)
2 Mounting Screw, Counter Assembly
3 Counter Chassis
4 Temporary Centerline
5 Counter Drive Front Bearing Plate
6 Tuning Shaft
7 Bead Chain
8 Drive Sprocket (MP219)
9 Counter Shaft
10 Counter Sprocket Gear
11 Bead Chain Tension Spring
12 Couplings and Coupling Springs (MP208 through MP211)

Step 18. Replace RF head in receiver chassis (see paragraph 6-5a(2)).

Step 19. Return receiver chassis to operational position (see paragraph 6-3b).

m. REPLACING FRONT PANEL CONTROLS.

To replace the FSK SENSE, AGC-MAN, NOISE CANCEL, and AUDIO (frequency) switches, the AUDIO (jack), and the RF GAIN MAN and AUDIO-LEVEL controls, the RF head must be removed (see paragraph 6-5a(1) and (2)). The CRT and POWER switches are mounted on an access plate (see figure 6-21) which is secured to the front panel by four machine screws. To replace these switches, remove access plate. The ANTENNA SELECTOR switch is mounted on the RF head. The RF head must be removed from the receiver chassis in order to replace the ANTENNA SELECTOR switch (see paragraph 6-5a(1) and (2)). The BAND WIDTH CPS switch is mounted on the narrow band IF filters assembly which must be removed (see paragraph 6-5a(5) and (6)) in order to replace the switch.

n. REPLACING FILTER Z201.

To replace filter Z201 proceed as follows:

Step 1. Remove RF head from receiver chassis as described in paragraph 6-5a(1).

Step 2. Carefully set RF head on its smooth side (counter up) and remove tubes V204 and V206.

Step 3. Carefully place RF head in that position wherein the two tuning capacitor gangs rest on the smooth table top with the side deck of the RF head toward you (counter pointing away from you).

Step 4. Along that edge of the side deck which is bolted to the casting, find the hole which is just to the right of socket XV204. Feeding through this hole will be an orange wire and a shielded wire.

Step 5. Unsolder this orange wire from pin B of filter Z202. (Do not unsolder the other wire which is on this terminal.)

Step 6. Untack from the other shields, the shield of the wire located in step 4. Carefully unsolder the blue wire inside this shield from pin 7 of relay K201 (pin 7 is directly opposite the grounded pin in this section of the relay).

Step 7. Along that edge of the side deck which is bolted to the casting, find the hole which is just to the left of socket XV206. Feeding through this hole will be a shielded wire and a gray wire.

Step 8. Unsolder this gray wire from pin K of filter Z202. (Do not unsolder the other wire which is on this terminal.)

Step 9. Untack from the other shields the shield of the wire located in step 7. Carefully unsolder the green wire inside this shield from pin 3 of relay K201. (This pin is directly opposite the 39K pin in this section of the relay.)

Step 10. Carefully place RF head on its smooth side (counter up). Feed the two spaghettied pairs of leads out through the two holes (use a long needle nose pliers as an aid).

Step 11. Carefully set RF head down on the tops of the two tuning capacitor gangs with the counter away from you. Using a spin-tight wrench, remove the two nuts which mount the filter unit Z201 (one nut is just to the right of socket XV201, the other nut is just to the left of socket XV205). Save these lockwashers and nuts.

Step 12. Carefully place the RF head on its smooth side (counter up) with the tuning capacitors on your right hand side. Rotate the RF head 45 degrees until you can look in and clearly see the insulated terminals on the tuning gang nearest the side deck (C202).

Step 13. Look in toward these capacitor terminals and identify the two insulated capacitor terminals against which the two spaghettied pairs of wires should rest. Counting up from the table top the spaghetti containing the orange lead should rest against the fourth terminal, and the spaghetti containing the gray lead should rest against the sixth terminal. During the replacement procedure it is imperative that the spaghettied leads be placed to these positions.

Step 14. With the RF head positioned as above, grasp filter unit Z201 in your right hand and slowly and firmly withdraw it from the RF head. It is important during this withdrawing process to use long needle nose pliers to carefully free the loose ends of the four leads from any surface edge on which they may catch.

Step 15. Be sure the replacement Z201 filter has the necessary connecting wires mounting on it. If not, remove the leads from the old unit and solder them to this new unit as follows:

Pin K to gray wire
Pin G to green shielded wire
Pin B to orange wire
Pin P to blue shielded wire
Both shields to their respective ground lugs.

Check that the piece of spaghetti holding the gray and green shielded wire together and the piece of spaghetti holding the orange and blue shielded wire together are each 4-1/2 inches long and each piece of spaghetti is pushed tightly against its ground lug.

Check that the length of shield on the green wire is 5-3/4 inches (from the ground lug mounting screw).

Check that the length of shield on the blue wire is 6-1/2 inches (from the ground lug mounting screw). The green and gray wires, and the orange and blue wires have been left extra long to aid in installation and will be cut to length later.

With a small piece of cellophane or electrical tape, firmly tape the end of the green wire and its shield tightly against the side of the gray wire. With another small piece of tape, firmly tape the end of the blue wire and its shield smoothly against the side of the orange wire.

Step 16. Set the RF head on its flat side, counter up and top of tuning capacitor facing you. Stand the new Z201 filter on that side which causes the PB terminals to be nearest the table top.

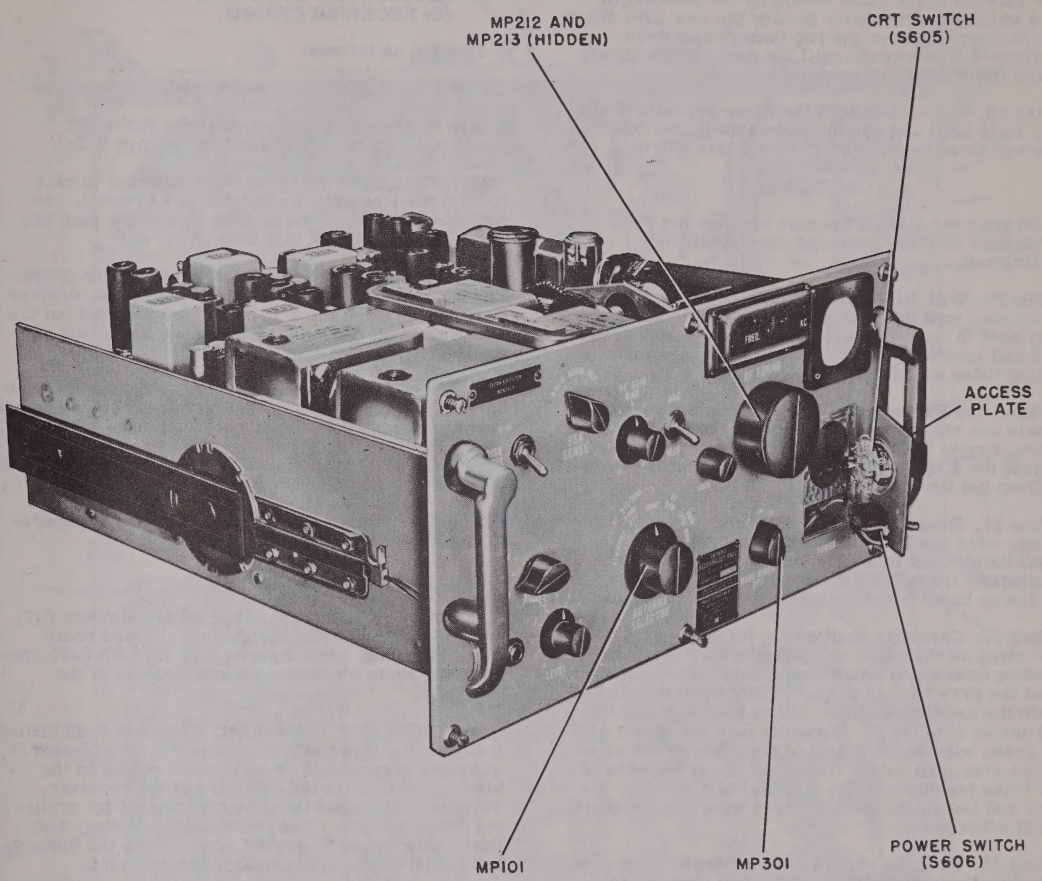


Figure 6-21. Front Panel, Switch Plate Removed

Thread the gray wire underneath the left hand tuning capacitor (C202) in that area between tubes V201 and V205. Immediately swivel the RF head around so that you can see the end of the gray wire as it feeds between the terminals of this tuning capacitor, and be sure that it feeds in between the sixth and seventh tuning capacitor terminals counting up from the table top. Now swivel the RF head back again to that position wherein you can see the gray wire projecting out on the left hand side of C202. Use a long needle nose pliers to grab this gray wire, pull it up along the side of the tuning capacitor and temporarily anchor it (around V208 for example).

Step 17. Repeat the procedure in step 16 for the orange wire, making sure it feeds between the fourth and fifth tuning capacitor terminals (counting up from the table top). When attempting to catch the orange wire with the long needle nose pliers, it will be found helpful to slightly tilt the RF head so that the needle nose can reach into the space left vacant by the removal of V204.

Step 18. Alternating between the gray wire and the orange wire, slowly pull the gray wire into the space made vacant by the removal of V206 and the orange wire into the space made vacant by the removal of V204 while simultaneously feeding the new Z201 filter into its space between the two tuning capacitors. Continue this procedure until the new Z201 is firmly seated in its mounting holes.

Step 19. Continue to hold the filter in position with your right hand and use the lockwashers and nuts removed from the old unit to mount this new unit.

CAUTION

Do not over-tighten the nuts because the threads on these mounting screws can be stripped.

Step 20. With RF head on its smooth side, tubes facing you, feed the gray wire into its hole immediately next to socket XV206, and carefully feed green wire and its shield into this same hole. Continue pulling these wires until both wires are taut.

Swivel the RF head until the C202 capacitor terminals are visible to you and, using the needle nose pliers, firmly seat this spaghettied pair of wires against the sixth capacitor terminal, counting up from the table top.

Step 21. Repeat the procedure in step 20 for the orange wire and its blue shielded wire using the hole immediately next to XV204, and firmly seating the spaghettied leads against the fourth terminal of the tuning capacitor counting up from the table top.

Step 22. Carefully position the RF head so that it is resting on the top of the tuning capacitors (tubes pointing downward) and with the side deck facing you. Feed the gray wire to pin K of Z202 (feed it underneath the existing wiring). Cut to length, strip, tin, and solder it to pin K. Carefully tack the shield of the green wire to the shield of the other green wire in this area, and solder the end of the green wire to pin 3 (the pin opposite the 39K pin) of the relay. Be sure that the shield and the green wire are not shorting to any other point.

Step 23. Feed the orange wire underneath the existing wiring to pin B of Z202. Cut the wire to length and strip, tin, and solder it to pin B. Carefully tack the shield on the blue wire to the other shields in this area and solder the blue wire to pin 7 (the pin opposite the ground lug pin). Be sure that the shield and blue wire are not shorting to any other point.

Step 24. Replace tubes V204 (5750/6BE6W) and V206 (5749/6BA6W).

o. ADJUSTMENT OF REAR LOCATING PINS ON RECEIVER CHASSIS.

Proceed as follows:

Step 1. Set POWER switch to OFF.

Step 2. Place receiver chassis in servicing position, front panel down (see paragraph 6-3a).

Step 3. Loosen the two screws adjacent to each of the rear locating pins (a total of 4 screws). Adjust the tightness of the screws so that the pins are loose and yet will not slip freely.

Step 4. Return the receiver chassis to the operational position (see paragraph 6-3b). If the receiver does not traverse the last inch of travel, pull out the receiver chassis again and try another position of the locating pins.

Step 5. When the receiver chassis can be inserted smoothly into the cabinet, return the receiver chassis to the servicing position, front panel down.

Step 6. Tighten the two screws adjacent to each of the pins (a total of 4 screws).

Step 7. Return the receiver chassis to the operational position.

6-8. ILLUSTRATIONS.

a. PARTS LOCATION. - Figure 6-1 through 6-21 show removal and disassembly details and some parts locations, while figures 6-22 through 6-31 complete the parts identification and location in the receiver.

b. SCHEMATIC DIAGRAMS. - Figures 6-32 through 6-41 are the schematic diagrams for the receiver. They are arranged in order corresponding to the signal flow through the circuitry of the receiver. Figures 6-42 shows the pin arrangement for multipin connector plugs and receptacles. Voltage and resistance values to ground are given in the voltage and resistance charts contained in Section 5.

c. WIRING DIAGRAMS. - The wiring of all receptacles for accessory equipment and all interconnecting plugs for sub-assemblies is shown in figure 6-43. Figures 6-44 through 6-50 are the wiring diagrams for the terminal boards and tube sockets on the rear deck.

Legend for Figure 6-22.

1 Open Clamp (Two)
2 Chassis Frame Cable
3 Captive Screw (Four)
4 Narrow Band IF Filters
5 Power Transformer T601
6 Chassis Frame
7 CR601
8 Lucite Plate MP613
9 CR602
10 Heat Sink for CR601 and CR602
11 CR603
12 CR604
13 Heat Sinks for CR603 and CR604
14 Lucite Plate Screw (Six)
15 Bristo Wrench MP607
16 Rear Deck
17 R521
18 XV507
19 P614
20 P615
21 R534
22 P613
23 P612

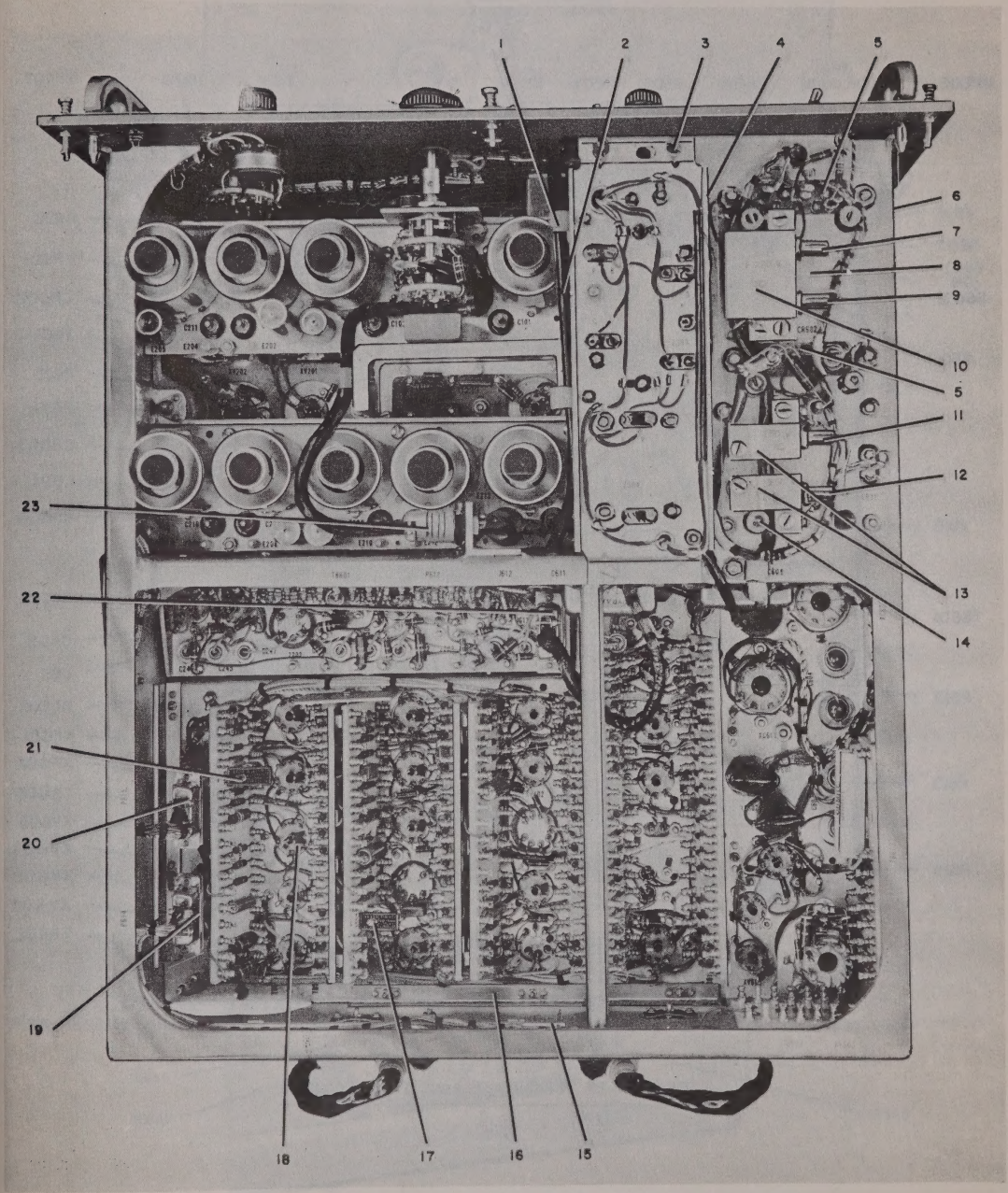


Figure 6-22. Receiver Chassis, Bottom View, Parts Location

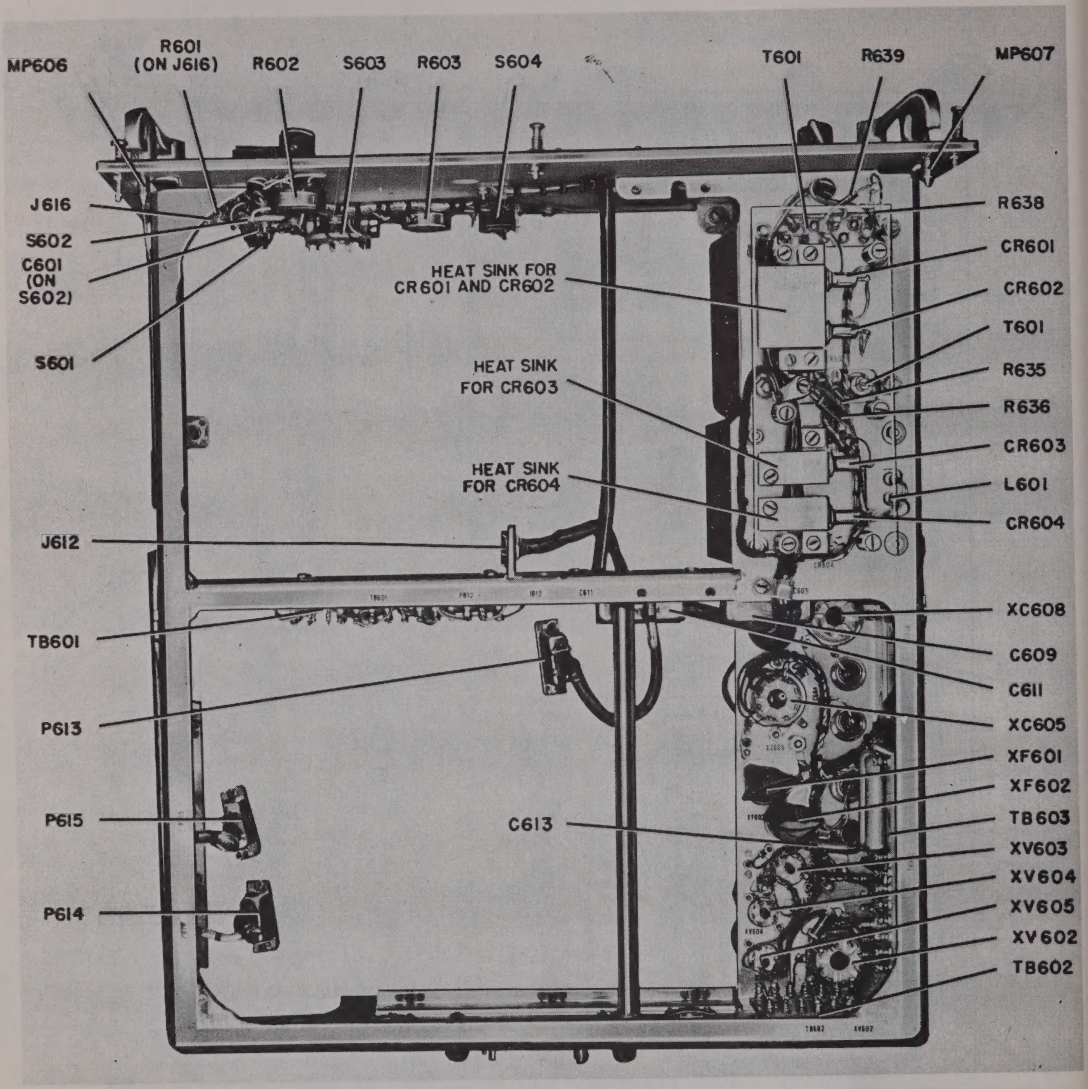


Figure 6-23. Chassis Frame, Parts Location

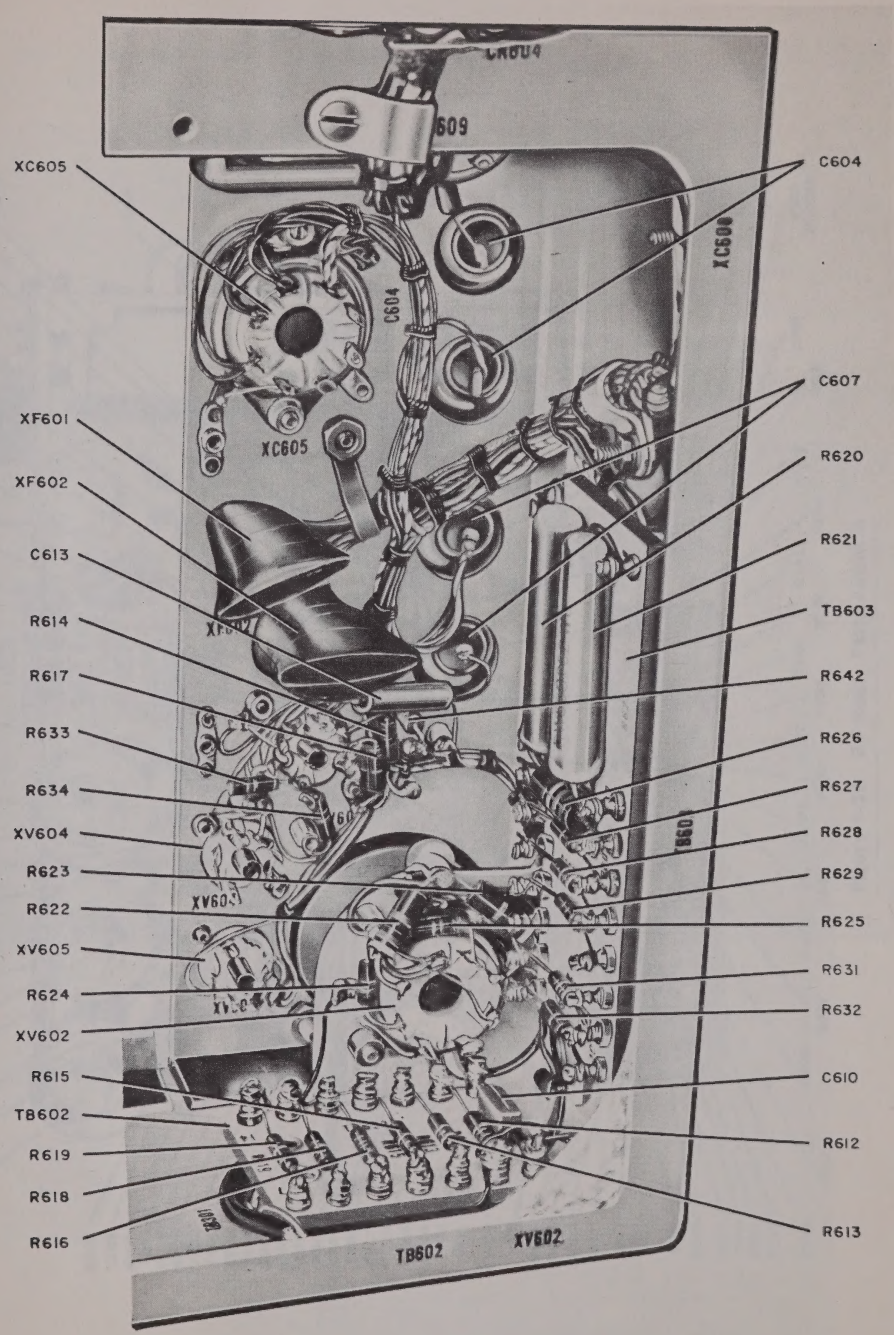


Figure 6-24. Terminal Board TB602 and TB603, Parts Location

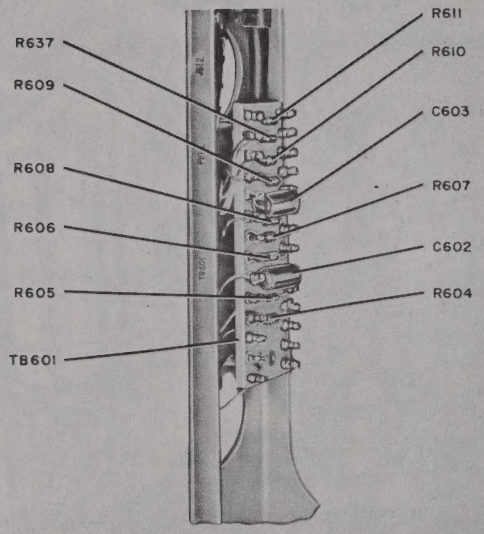


Figure 6-25. Terminal Board TB601, Parts Location

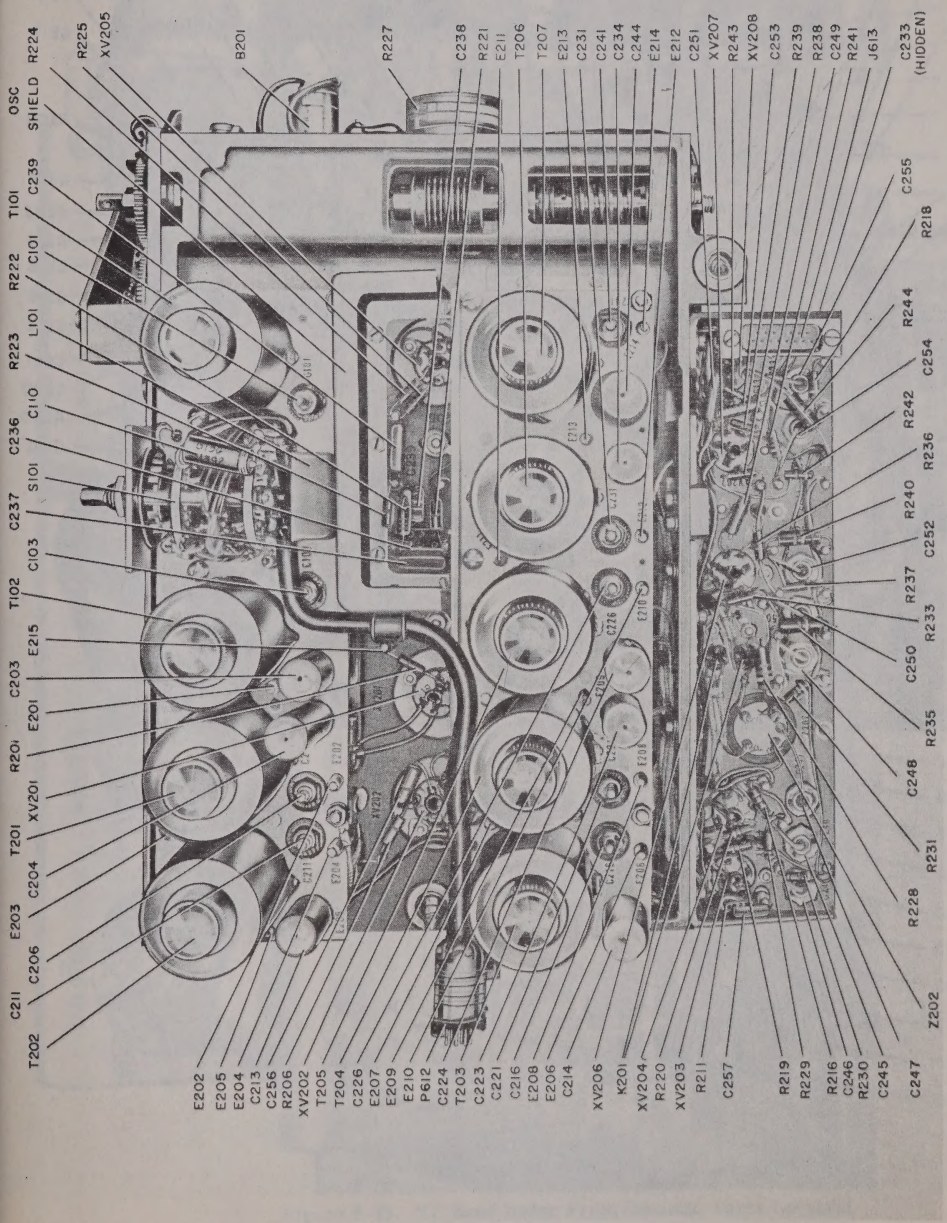


Figure 6-26. RF Head, Parts Location

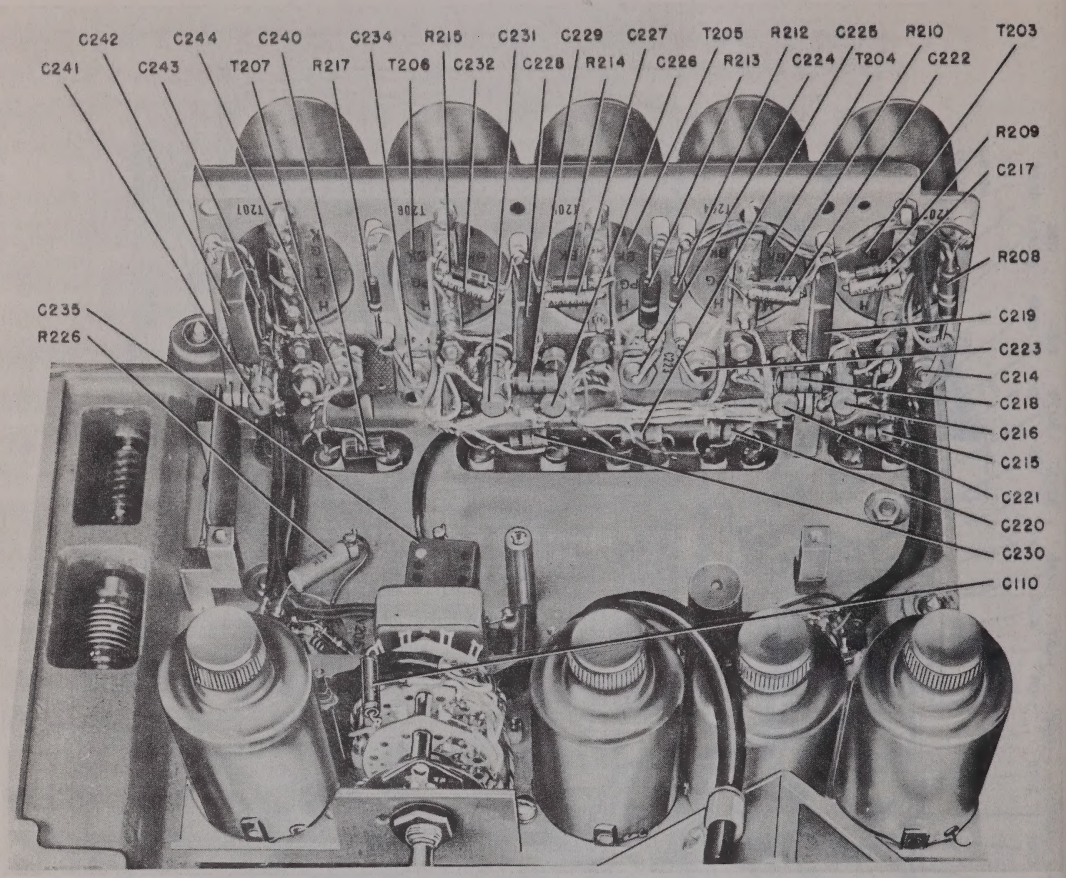


Figure 6-27. RF Head Under Rear Subdeck, Parts Location

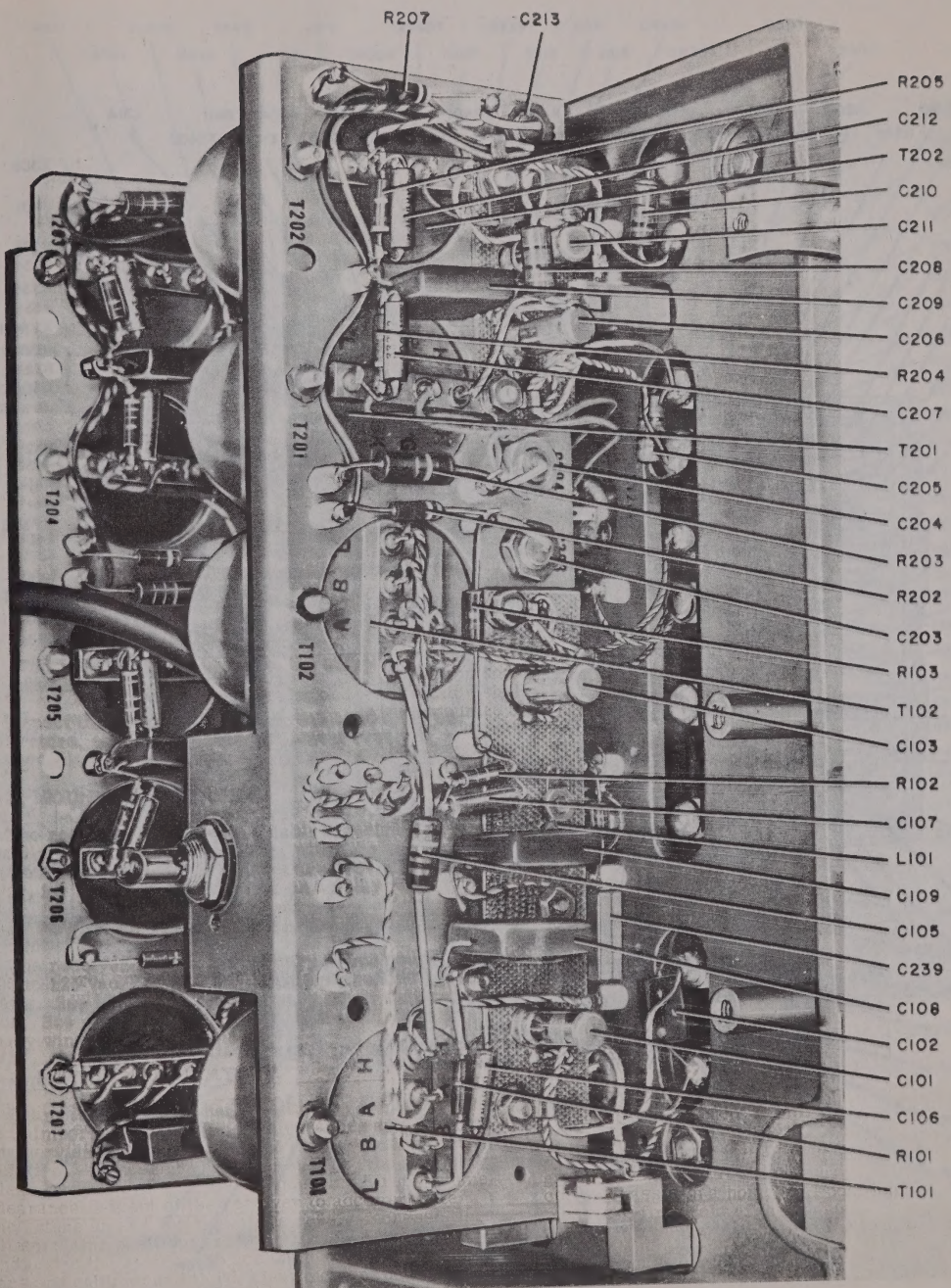


Figure 6-28. RF Head Under Front Subdeck, Parts Location

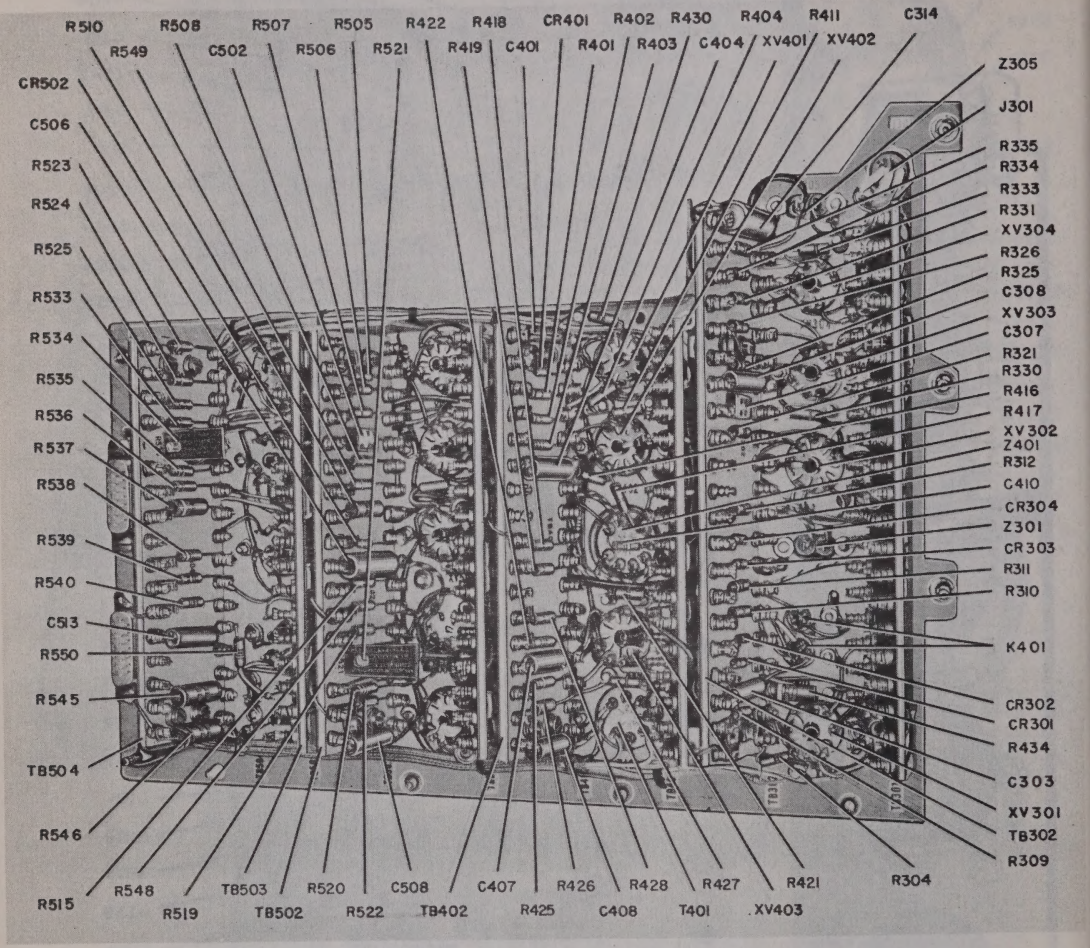


Figure 6-29. Rear Deck, Left Hand Terminal Boards, Parts Location

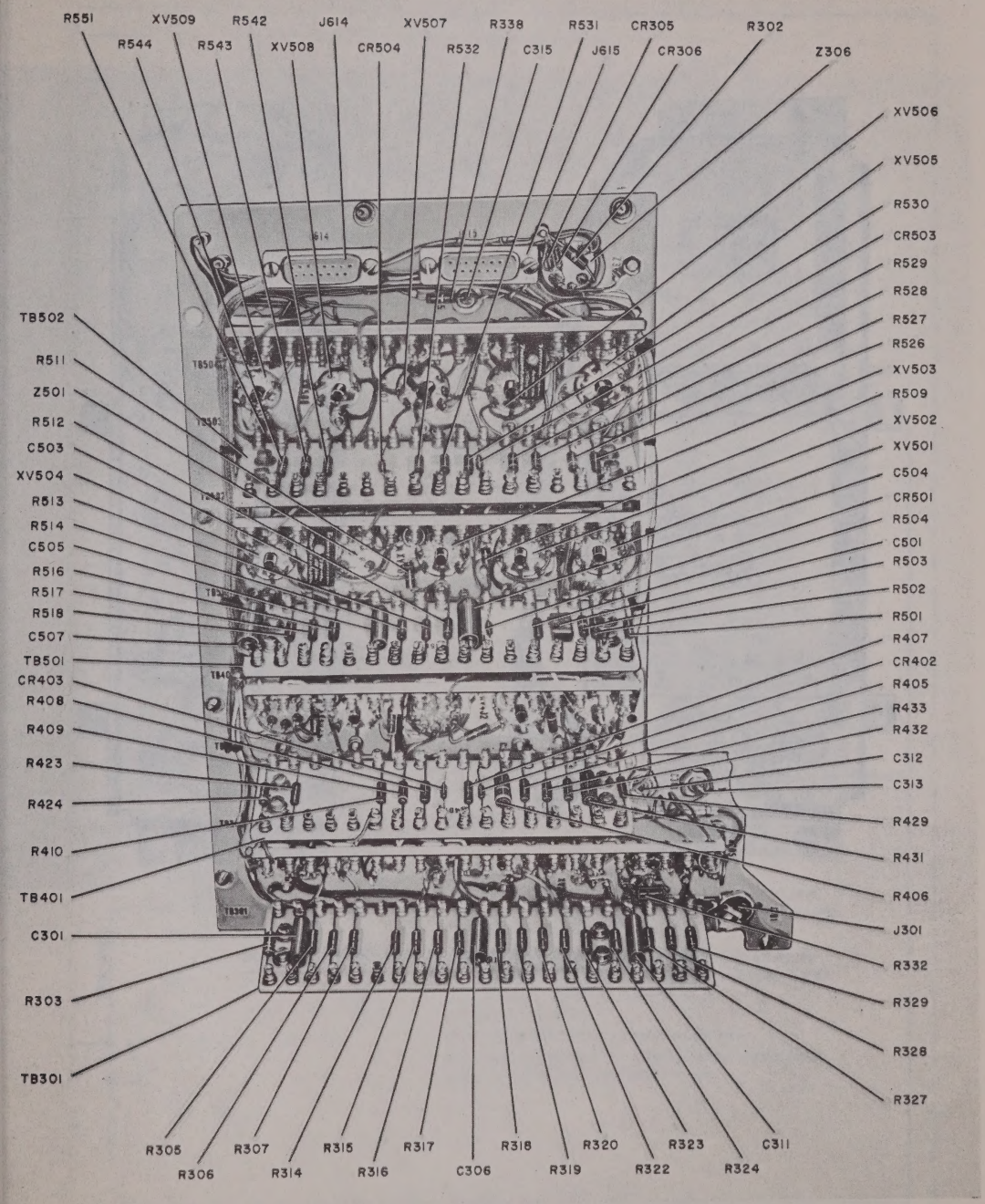


Figure 6-30. Rear Deck, Right Hand Terminal Boards, Parts Location

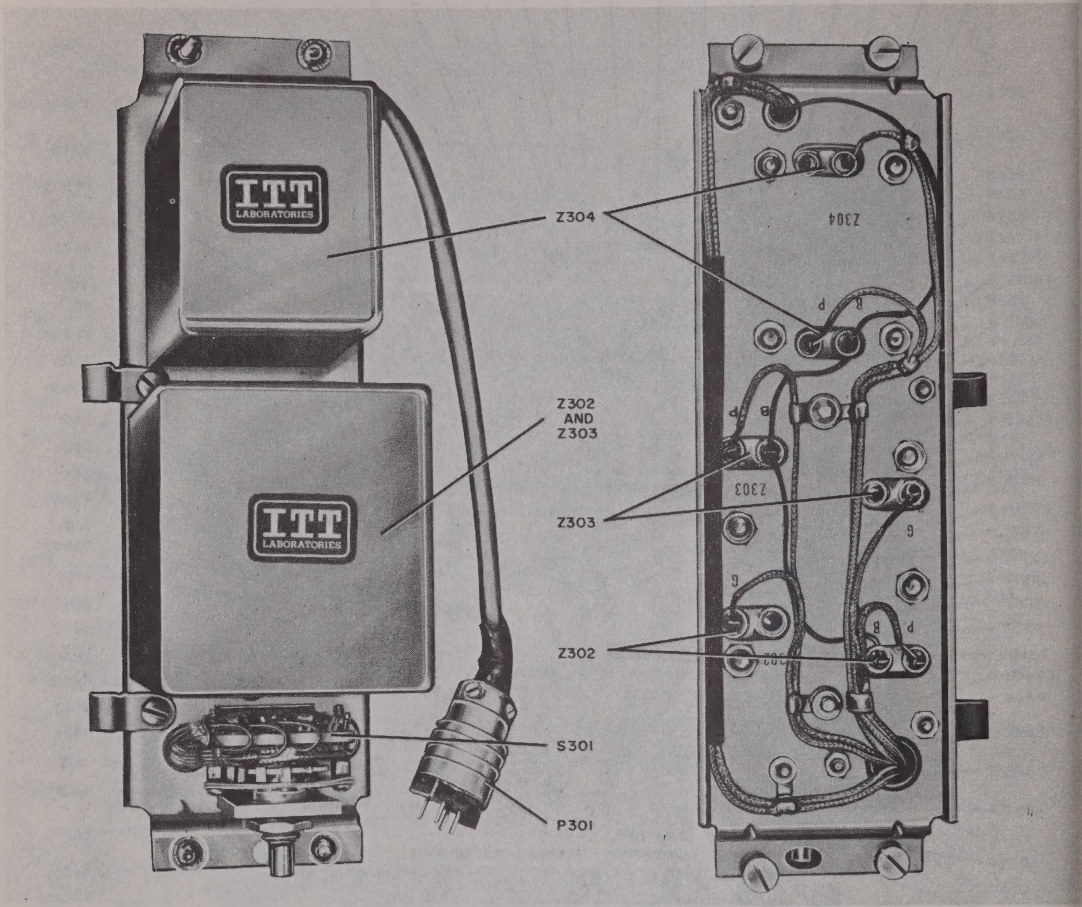


Figure 6-31. Narrow Band IF Filters, Parts Location

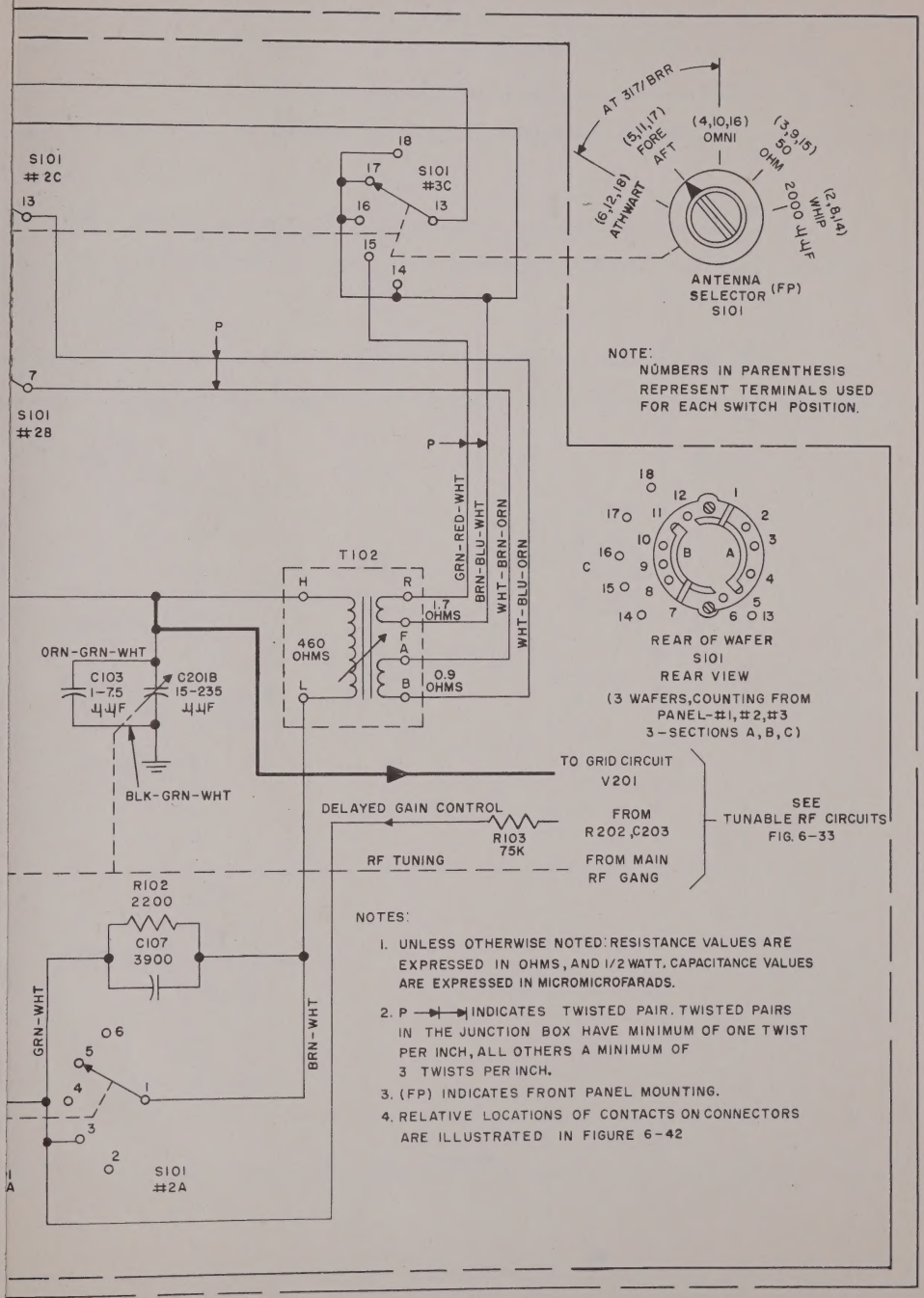


Figure 6-32. Radio Receiving Set AN/BRR-3 Antenna Coupling Circuits, Schematic Diagram

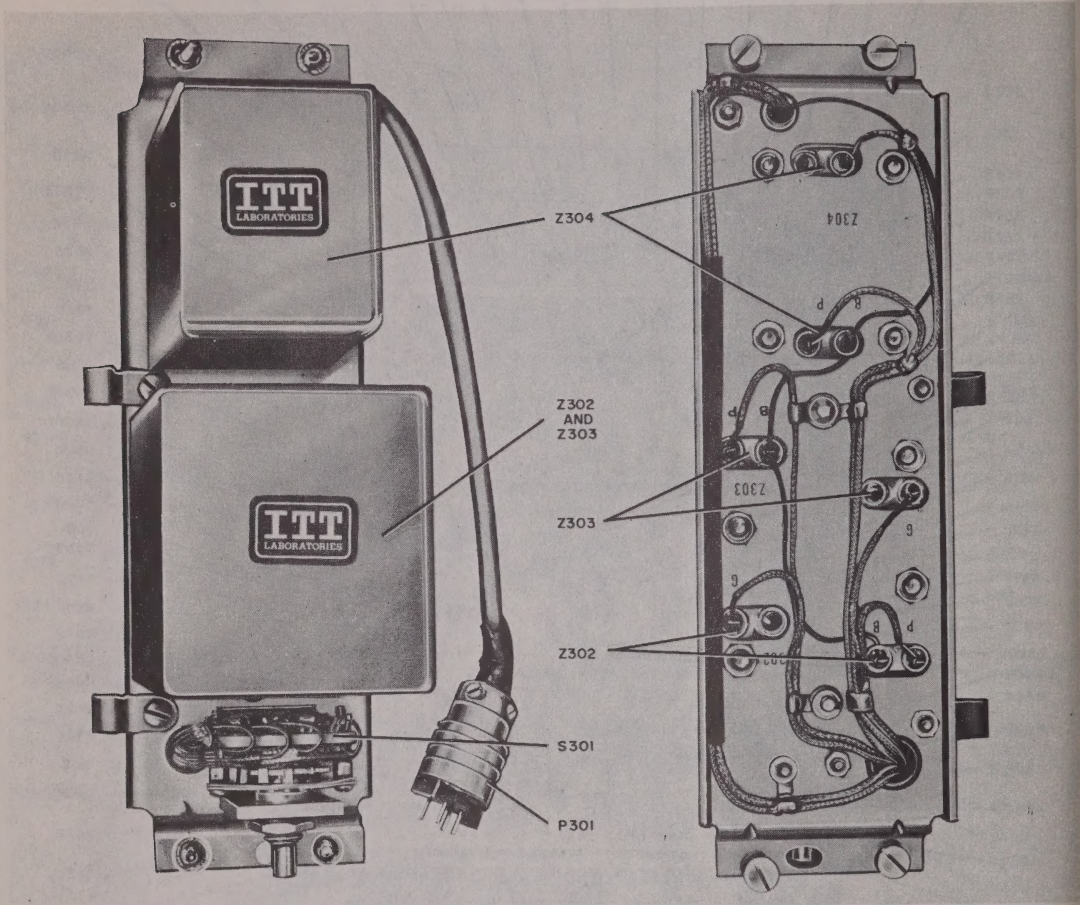


Figure 6-31. Narrow Band IF Filters, Parts Location

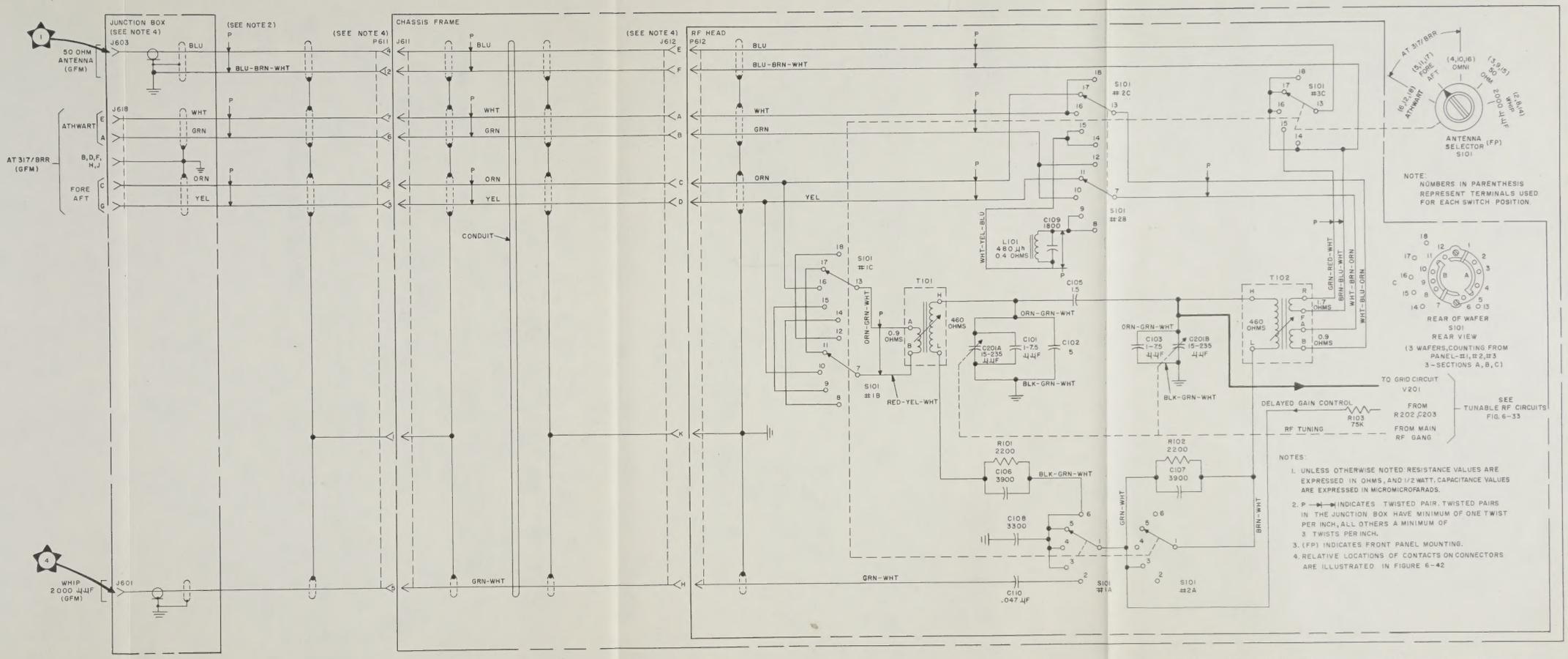
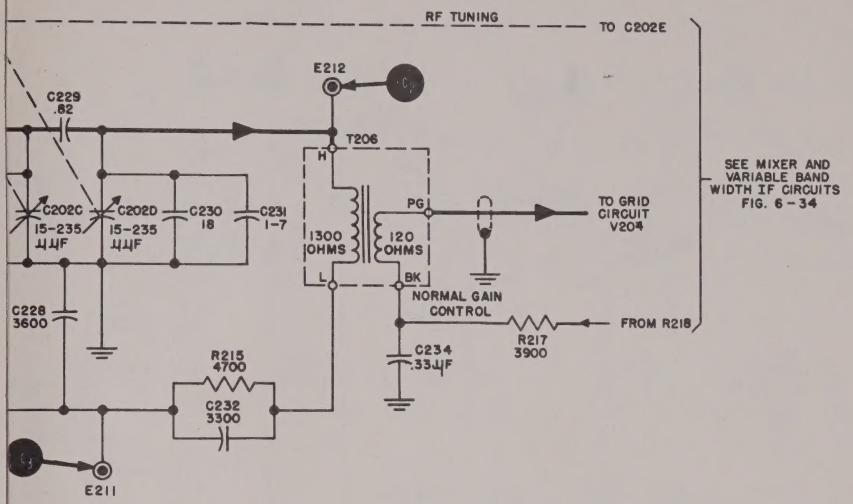


Figure 6-32. Radio Receiving Set AN/BRR-3 Antenna Coupling Circuits, Schematic Diagram



NOTES:

1. UNLESS OTHERWISE NOTED RESISTANCE VALUES ARE EXPRESSED IN OHMS, 1/2 WATT, AND CAPACITANCE VALUES ARE EXPRESSED IN MICROMICROFARADS
2. RELATIVE LOCATIONS OF CONTACTS ON CONNECTORS ARE ILLUSTRATED IN FIGURE 6-42
3. FREQUENCY GAIN CONTROL POTENTIOMETER ADJUSTED AT 14.0 KC FOR −2.5 VOLTS BETWEEN TERMINAL S AND GROUND.

ıre 6-33. Radio Receiving Set AN/BRR-3 Tunable RF Circuits, Schematic Diagram

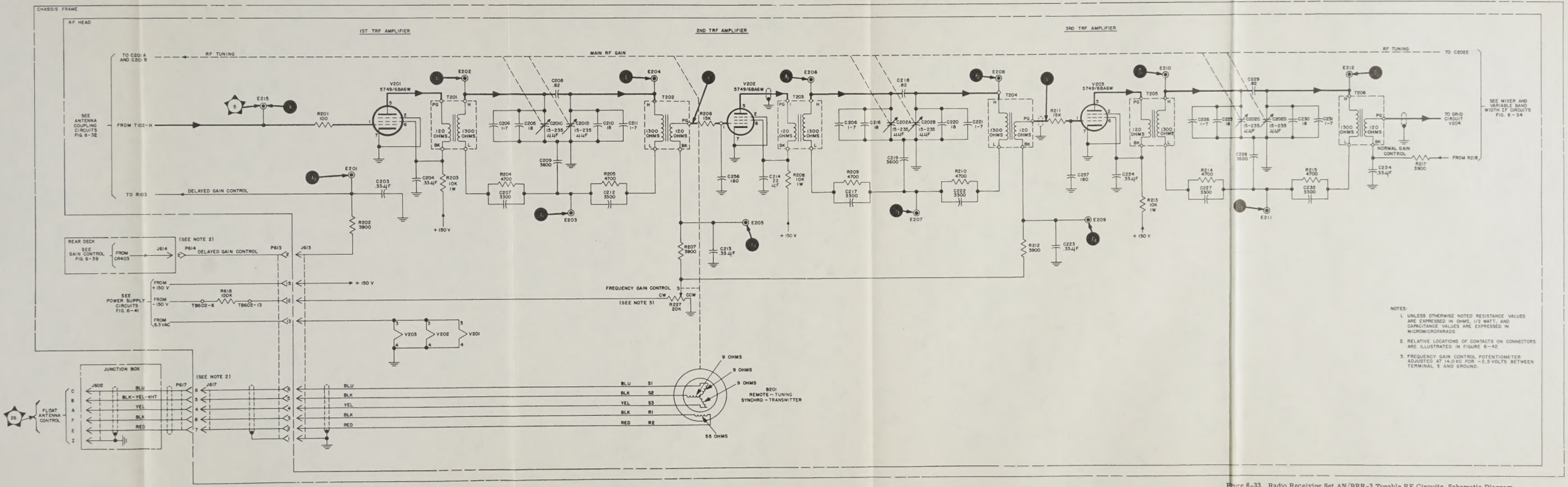
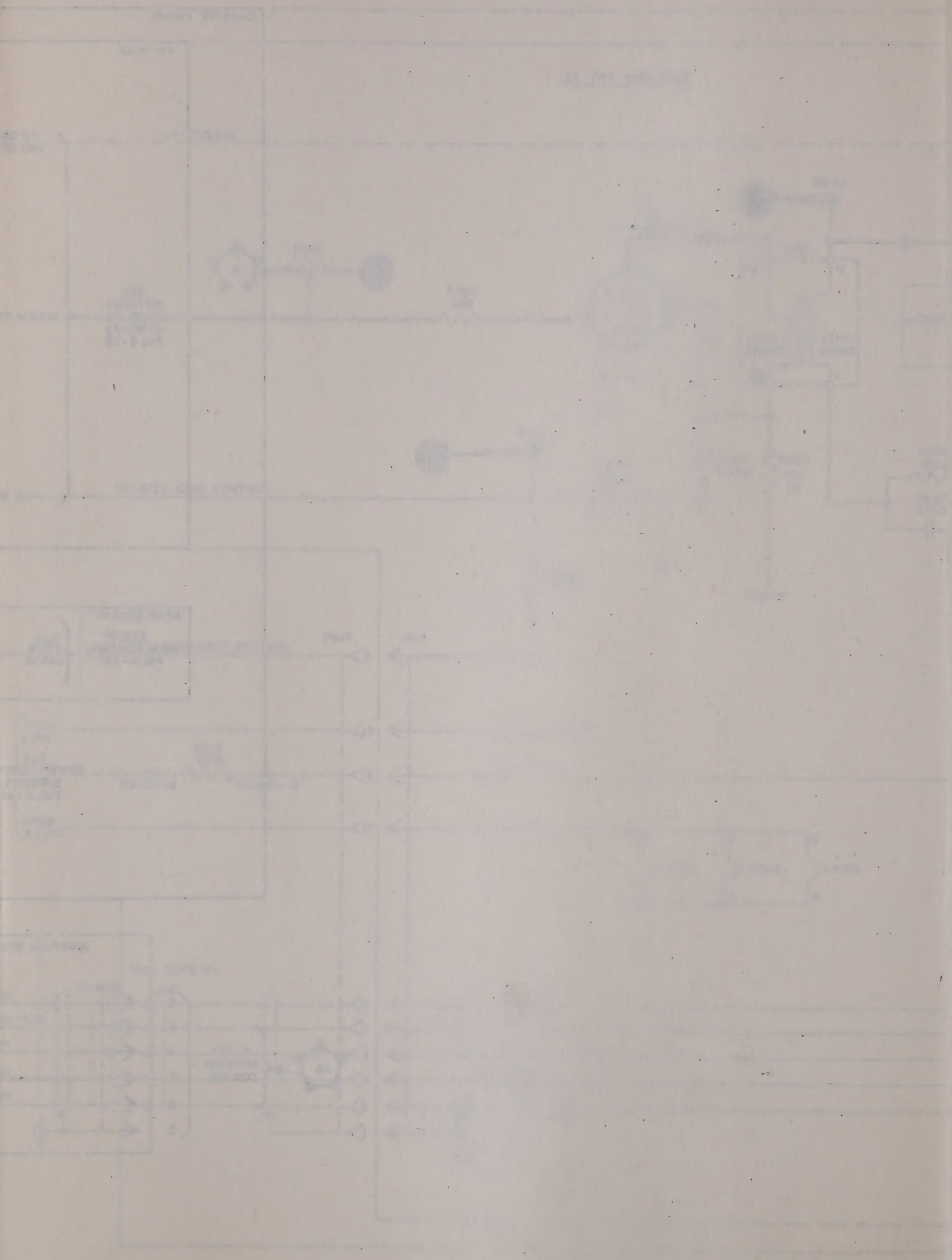
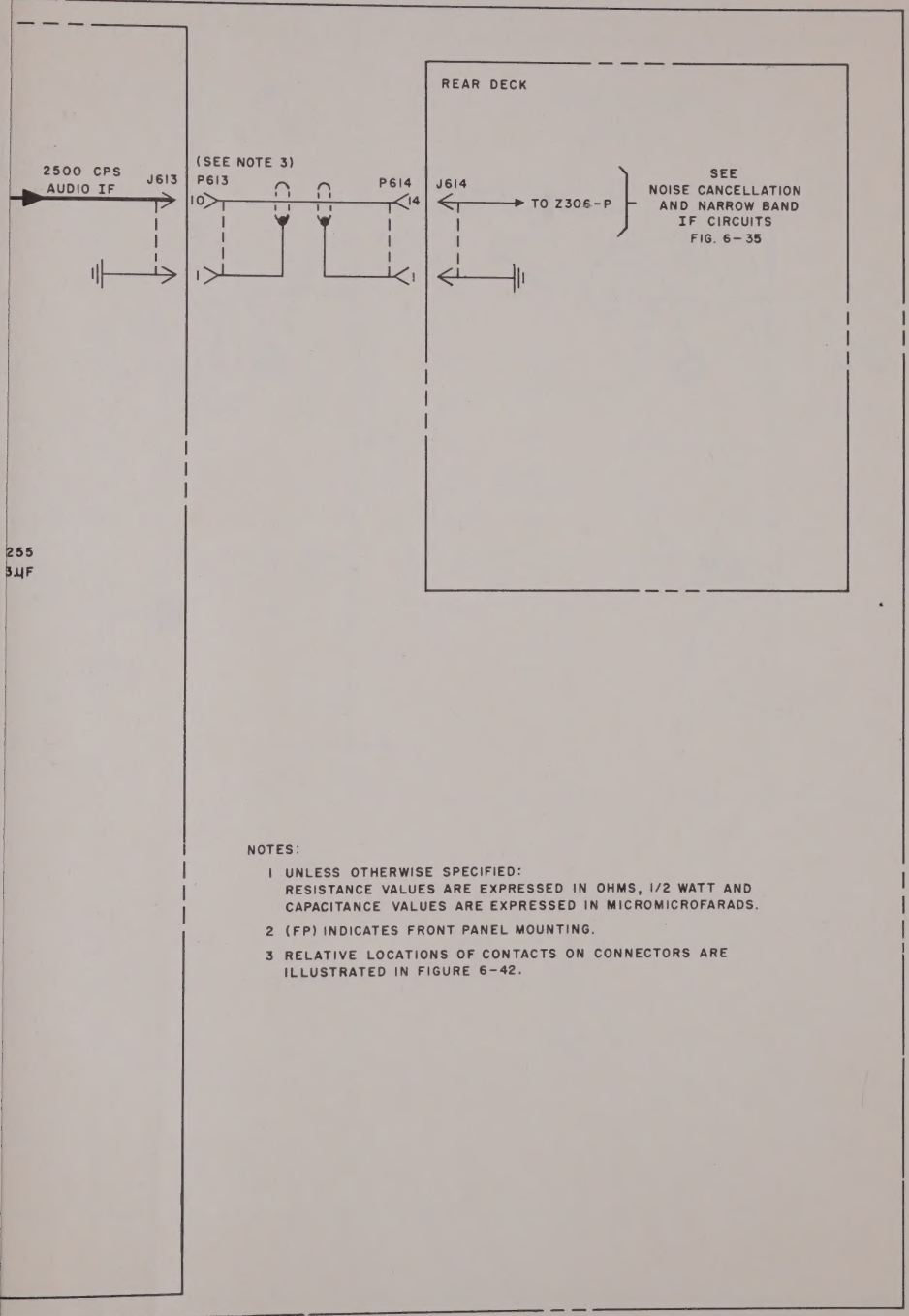


Figure 6-33. Radio Receiving Set AN/BRR-3 Tunable RF Circuits, Schematic Diagram





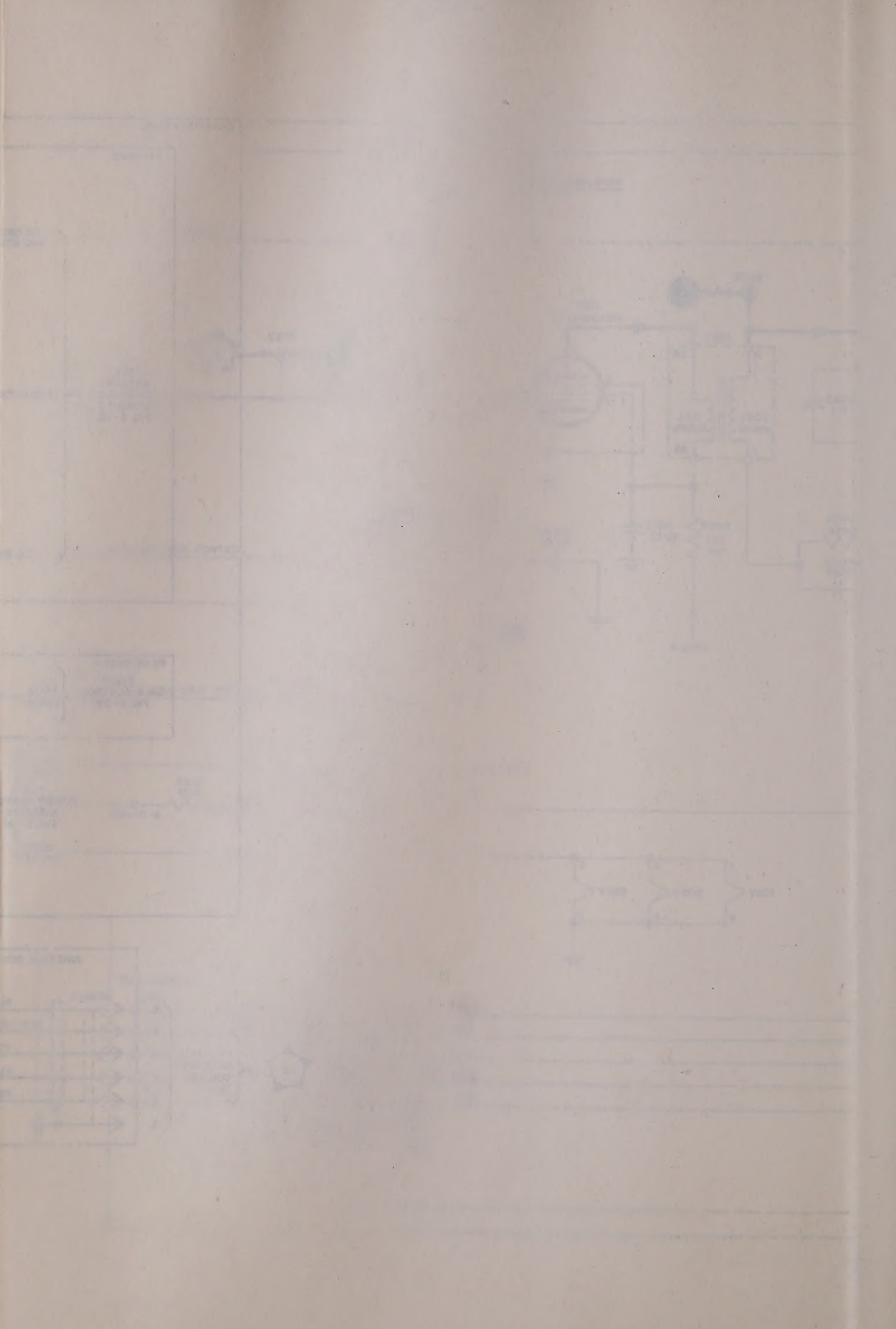
NOTES:

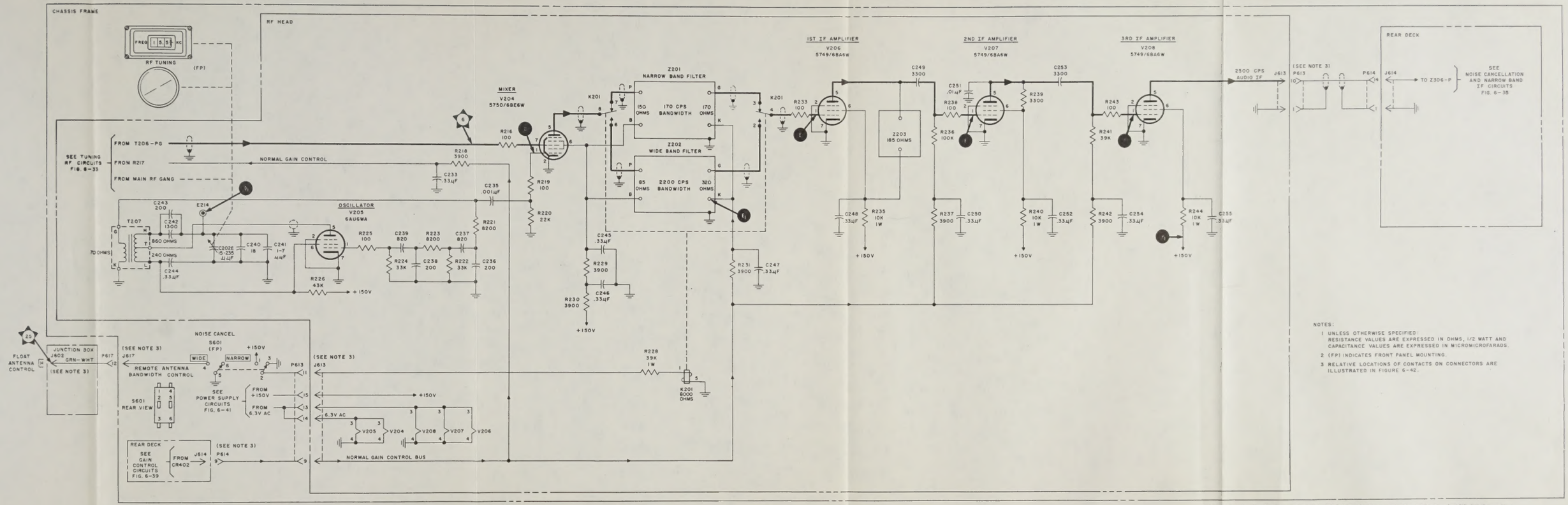
1 UNLESS OTHERWISE SPECIFIED:
RESISTANCE VALUES ARE EXPRESSED IN OHMS, 1/2 WATT AND
CAPACITANCE VALUES ARE EXPRESSED IN MICROMICROFARADS.

2 (FP) INDICATES FRONT PANEL MOUNTING.

3 RELATIVE LOCATIONS OF CONTACTS ON CONNECTORS ARE
ILLUSTRATED IN FIGURE 6-42.

e 6-34. Radio Receiving Set AN/BRR-3 Mixer and Variable Bandwidth IF Circuits, Schematic Diagram





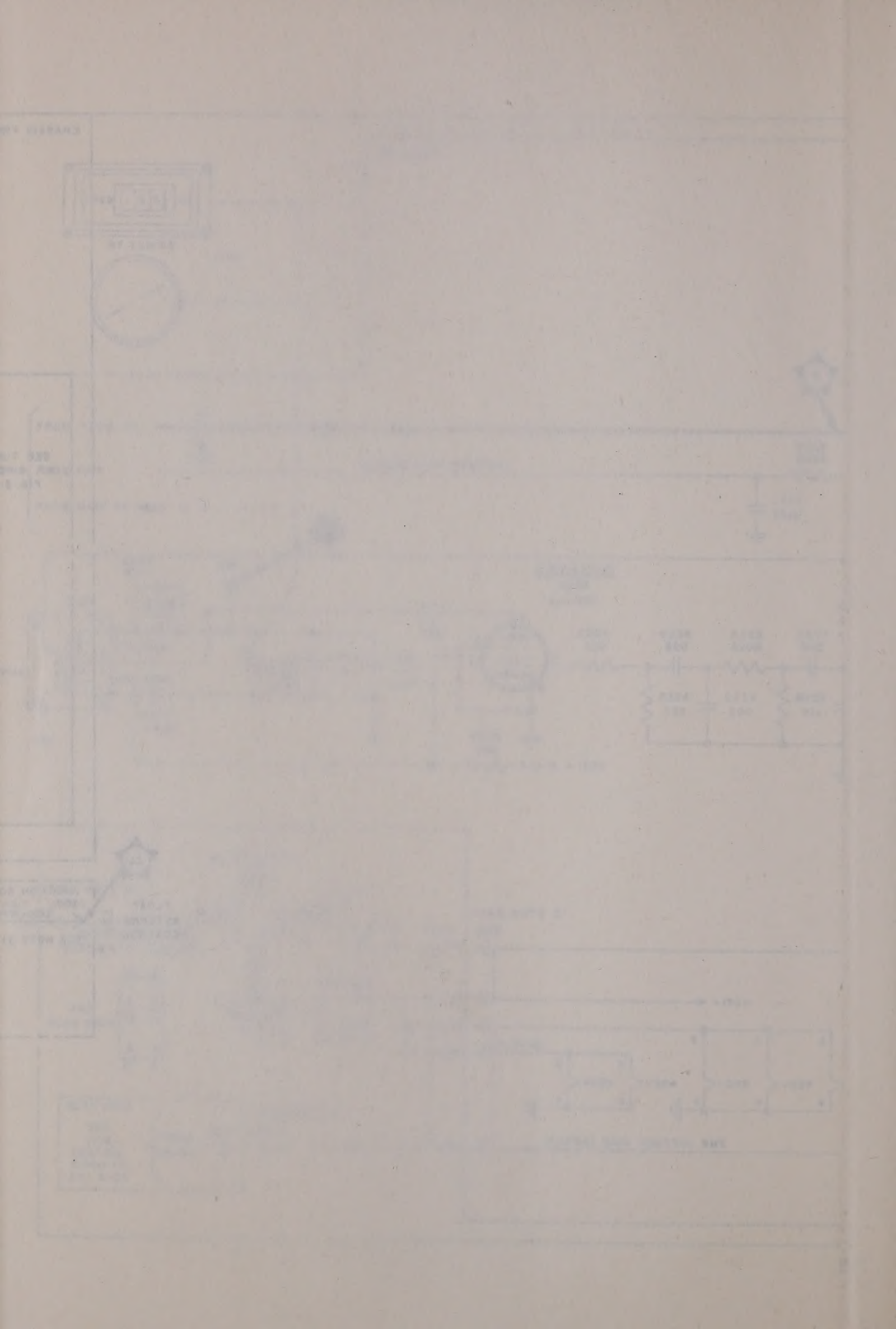
NOTES:

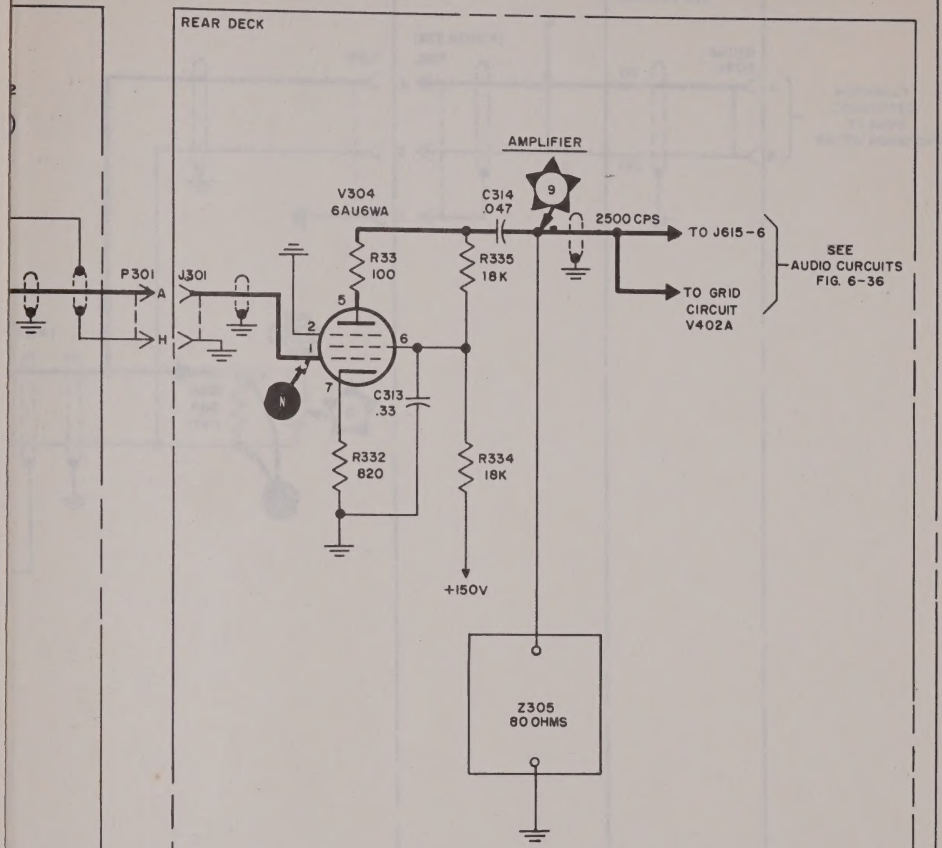
1 UNLESS OTHERWISE SPECIFIED:
RESISTANCE VALUES ARE EXPRESSED IN OHMS, 1/2 WATT AND CAPACITANCE VALUES ARE EXPRESSED IN MICROMICROFARADS.

2 (FP) INDICATES FRONT PANEL MOUNTING.

3 RELATIVE LOCATIONS OF CONTACTS ON CONNECTORS ARE ILLUSTRATED IN FIGURE 6-42.

Figure 6-34. Radio Receiving Set AN/BRR-3 Mixer and Variable Bandwidth IF Circuits, Schematic Diagram

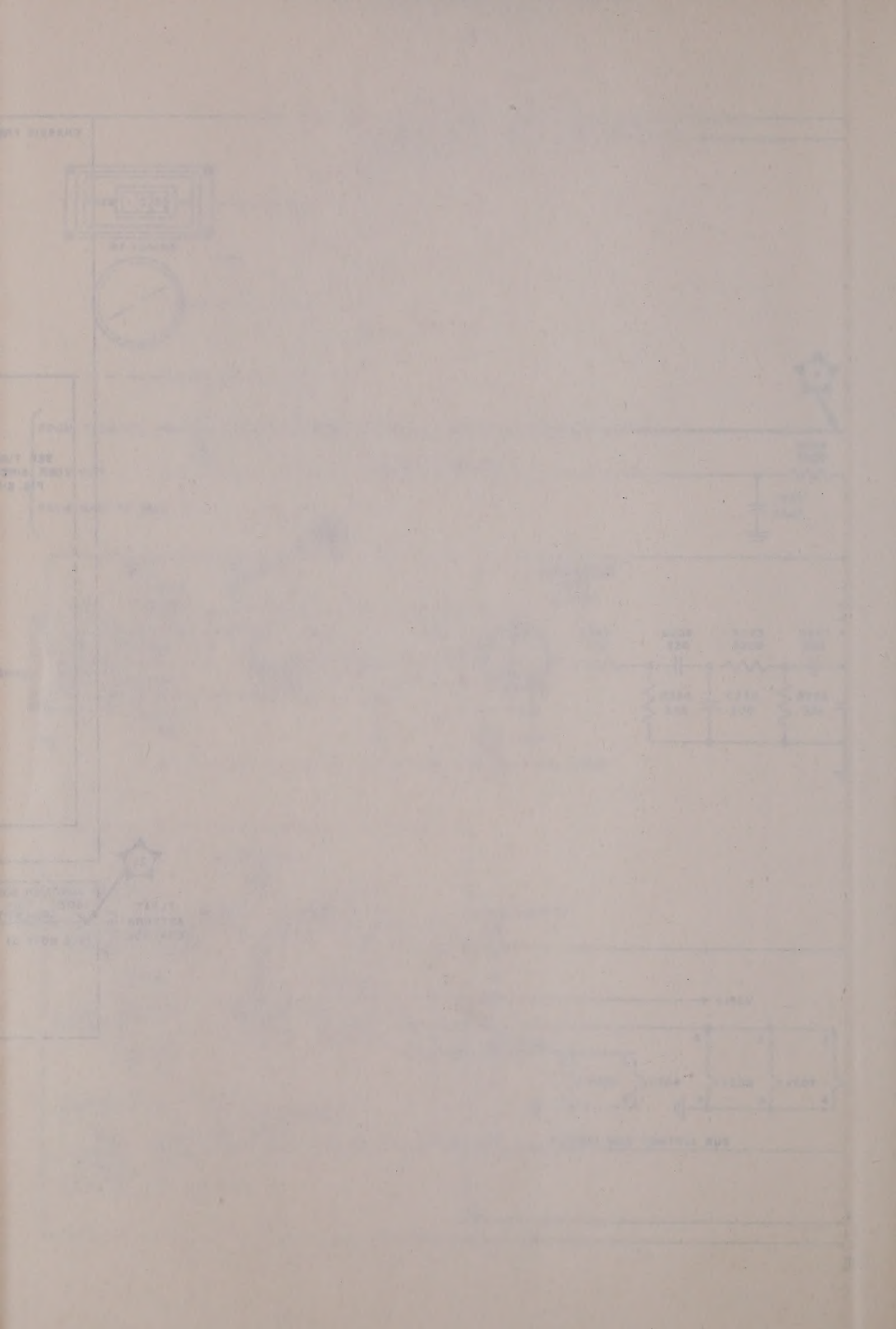




NOTES

1. UNLESS OTHERWISE SPECIFIED: RESISTANCE VALUES ARE IN OHMS, 1/2 WATT. CAPCITANCE VALUES ARE IN MICROFARADS.
2. DIODES ARE TYPE IN 459.
3. * FACTORY ADJUSTMENT GIVEN IS APPROXIMATE WHEN REPLACED IN FIELD, USE NOMINAL VALUES SHOWN.
4. UNLESS OTHERWISE NOTED THE COMPONENTS SHOWN ON THIS DRAWING ARE MOUNTED EITHER ON OR IN THE IMMEDIATE AERA OF TERMINAL BOARD TB301 AND TB302.(FP) INDICATES FRONT PANEL MOUNTING.
5. RELATIVE LOCATIONS OF CONTACTS ON CONNECTORS ARE ILLUSTRATED IN FIGURE 6-42

35. Radio Receiving Set AN/BRR-3 Noise Cancellation and Narrow Band IF Circuits, Schematic Diagram



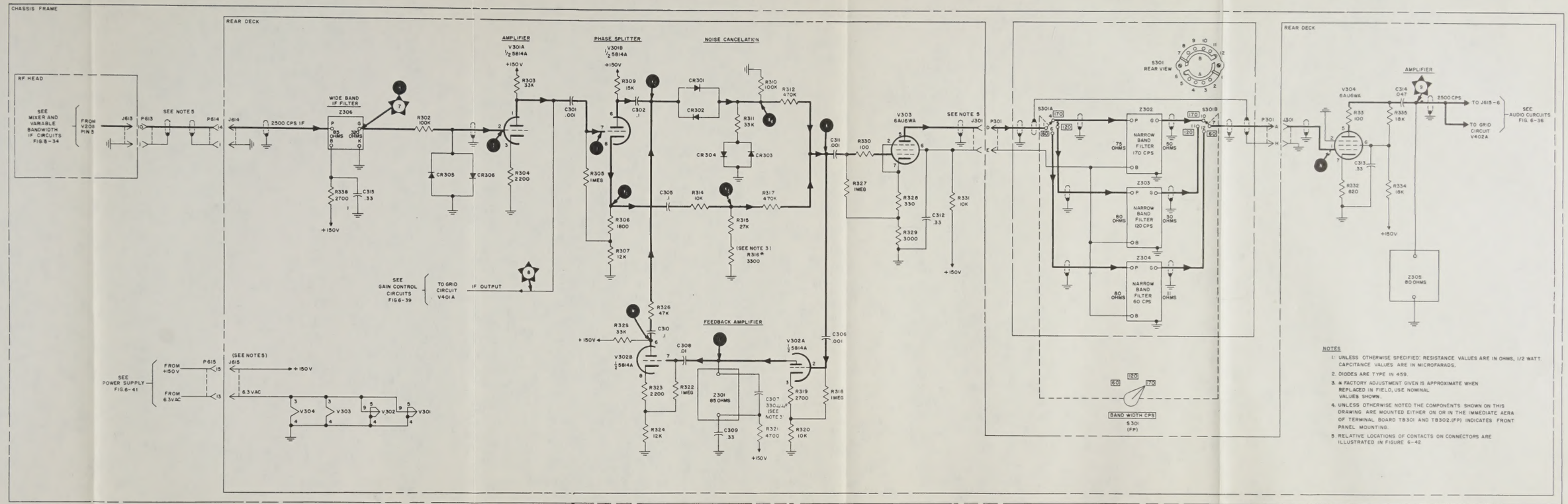
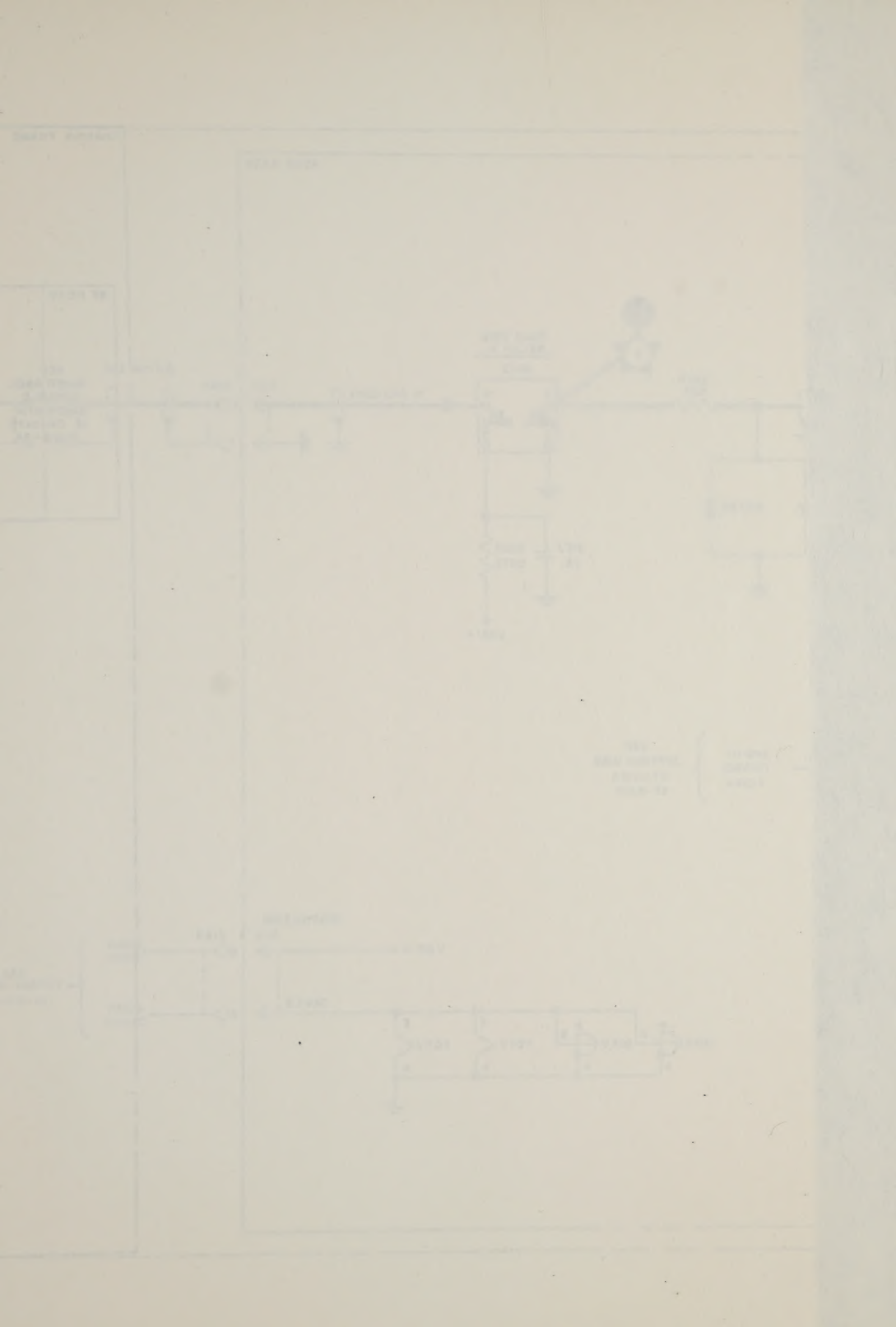


Figure 6-35. Radio Receiving Set AN/BRR-3 Noise Cancellation and Narrow Band IF Circuits, Schematic Diagram



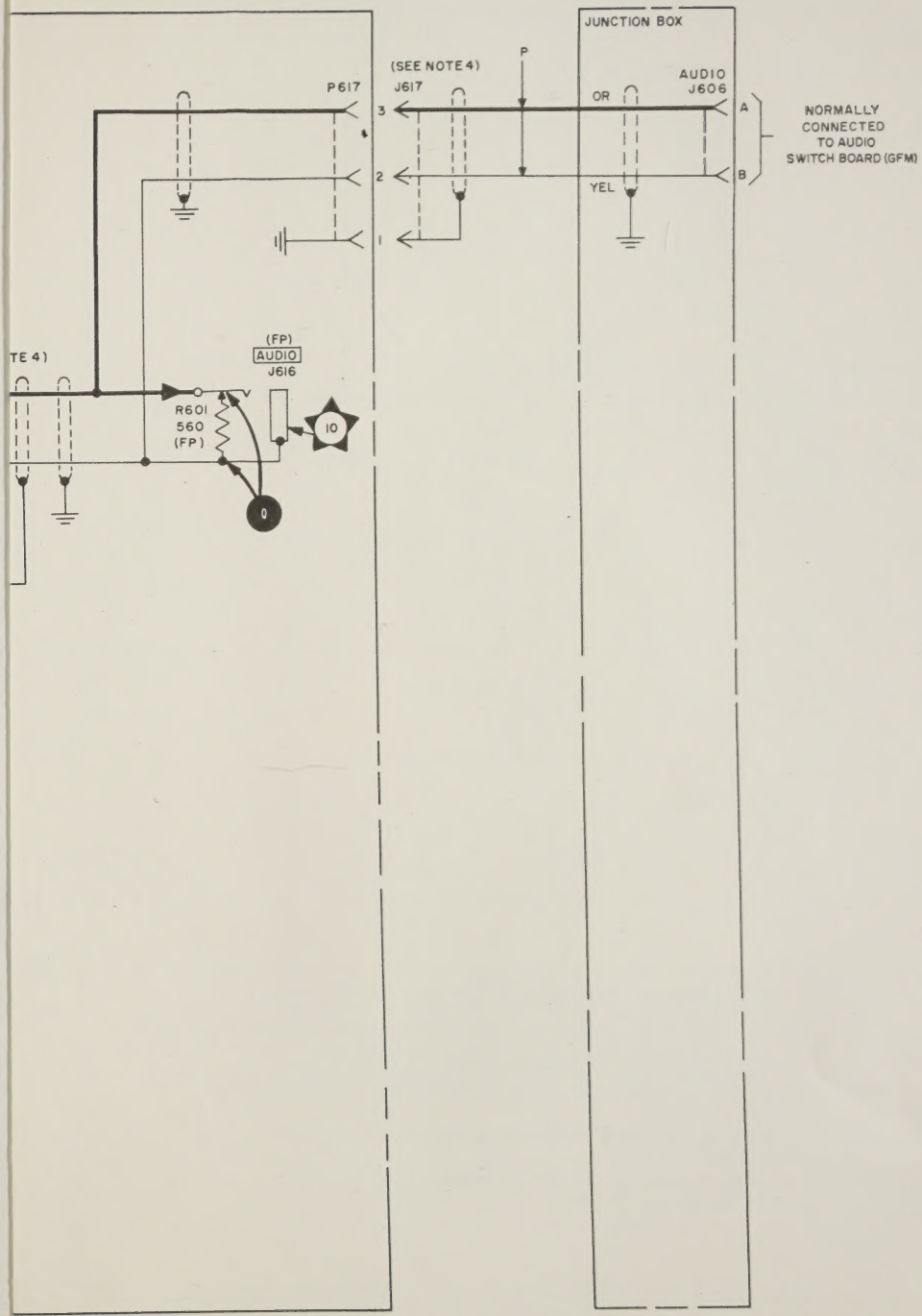
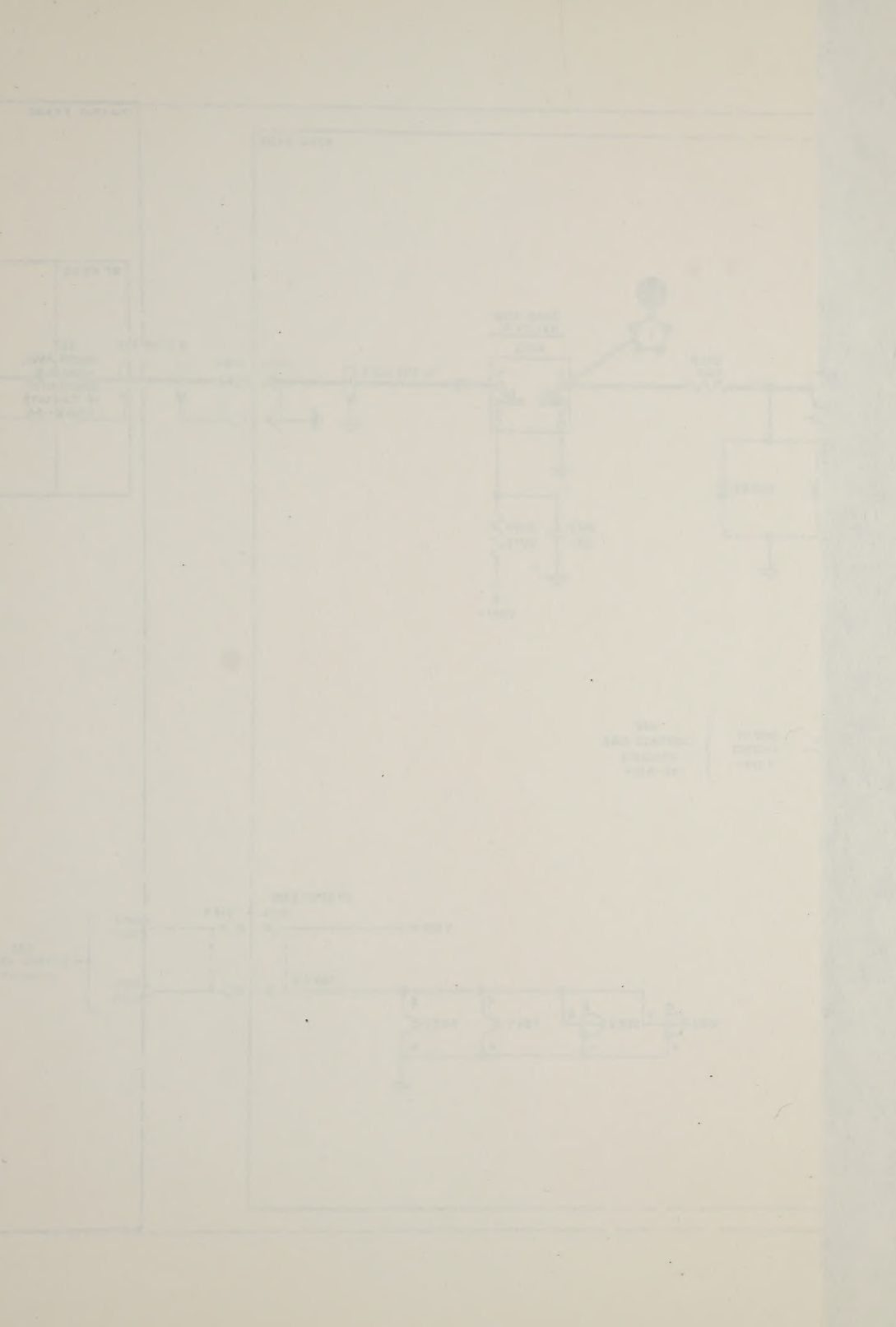


Figure 6-36. Radio Receiving Set AN/BRR-3 Audio Circuits, Schematic Diagram



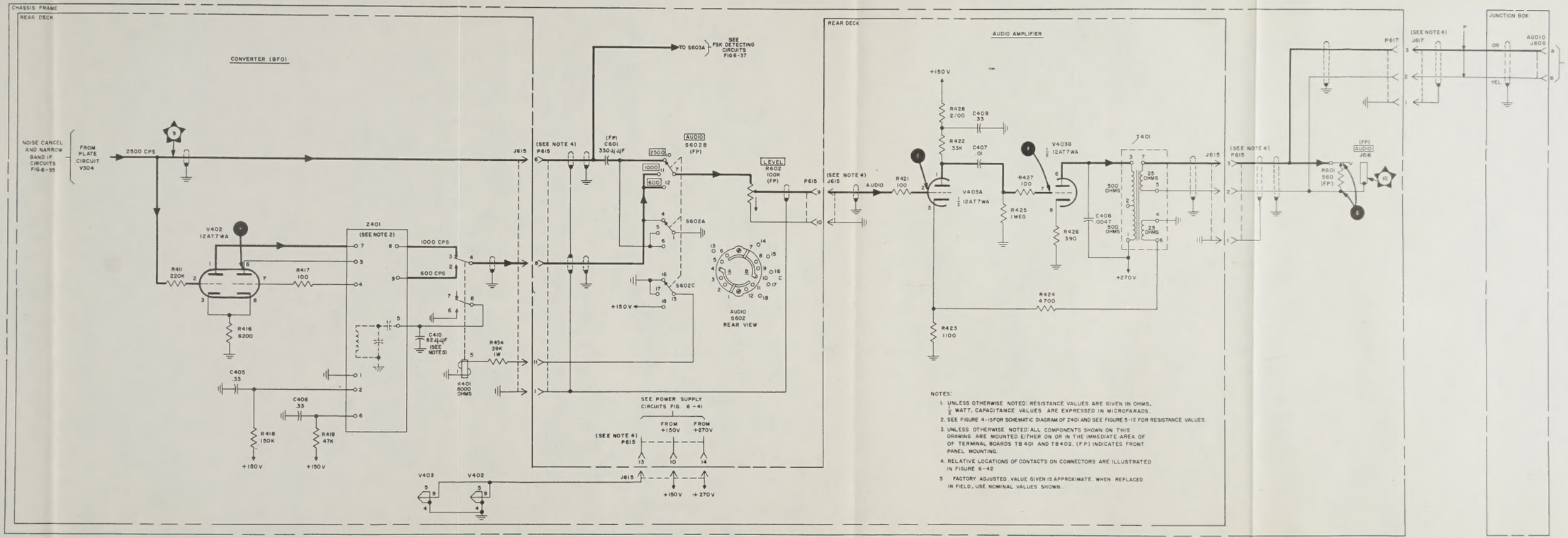
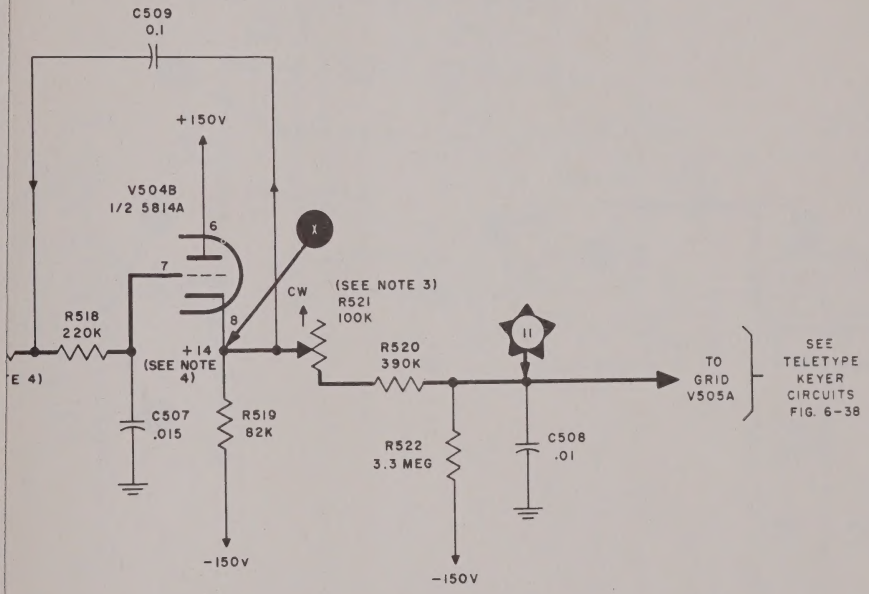


Figure 6-36. Radio Receiving Set AN/BRR-3 Audio Circuits, Schematic Diagram

W PASS FILTER

V504
5814A
(SEE NOTE 5)



NLESS OTHERWISE SPECIFIED:
ESISTANCE VALUES ARE EXPRESSED IN OHMS,
2 WATT; CAPACITANCE VALUES ARE EXPRESSED IN MICROFARADS.

FACTORY ADJUSTMENT VALUE GIVEN IS APPROXIMATE. WHEN DISCRIMINATOR IS REPLACED IN FIELD, USE OMINAL VALUE STAMPED ON DISCRIMINATOR UNIT.

ITH FSK SWITCH IN HOLD, CRT SWITCH IN FSK FINE TUNE, AND V503 REMOVED, R521 IS ADJUSTED TO CENTER RACE ON CRT. ALL VOLTAGES SHOWN ARE THEN APPROXIMATE AND MUST BE MEASURED WITH A DC VTVM.

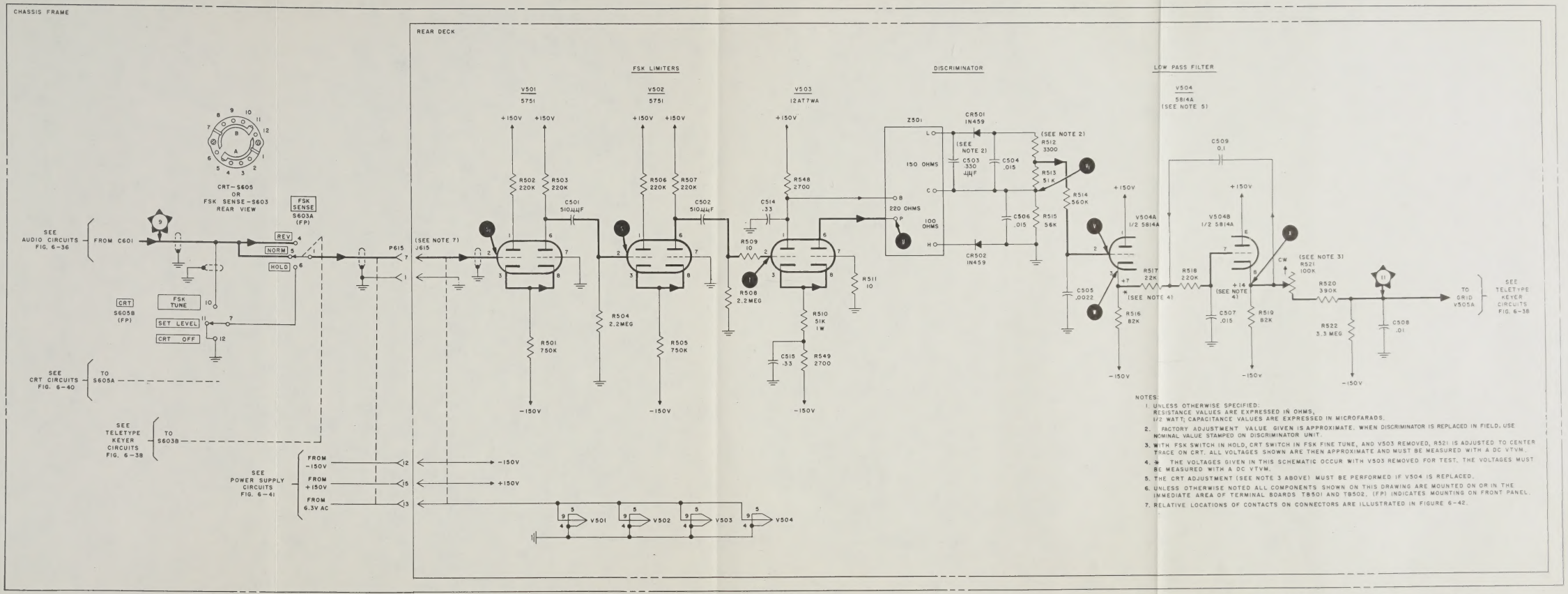
THE VOLTAGES GIVEN IN THIS SCHEMATIC OCCUR WITH V503 REMOVED FOR TEST. THE VOLTAGES MUST E MEASURED WITH A DC VTVM.

HE CRT ADJUSTMENT (SEE NOTE 3 ABOVE) MUST BE PERFORMED IF V504 IS REPLACED.

NLESS OTHERWISE NOTED ALL COMPONENTS SHOWN ON THIS DRAWING ARE MOUNTED ON OR IN THE MMEDIATE AREA OF TERMINAL BOARDS TB501 AND TB502. (FP) INDICATES MOUNTING ON FRONT PANEL.

ELATIVE LOCATIONS OF CONTACTS ON CONNECTORS ARE ILLUSTRATED IN FIGURE 6-42.

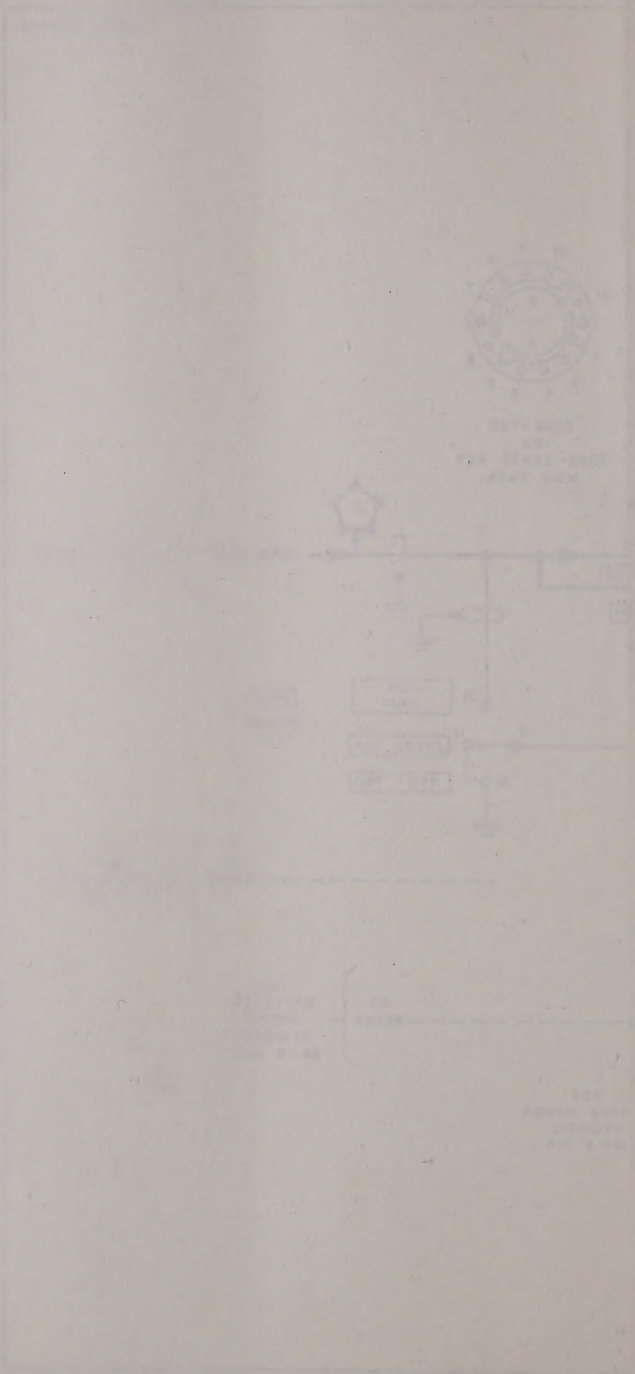
e 6-37. Radio Receiving Set AN/BRR-3 FSK Detecting Circuits, Schematic Diagram

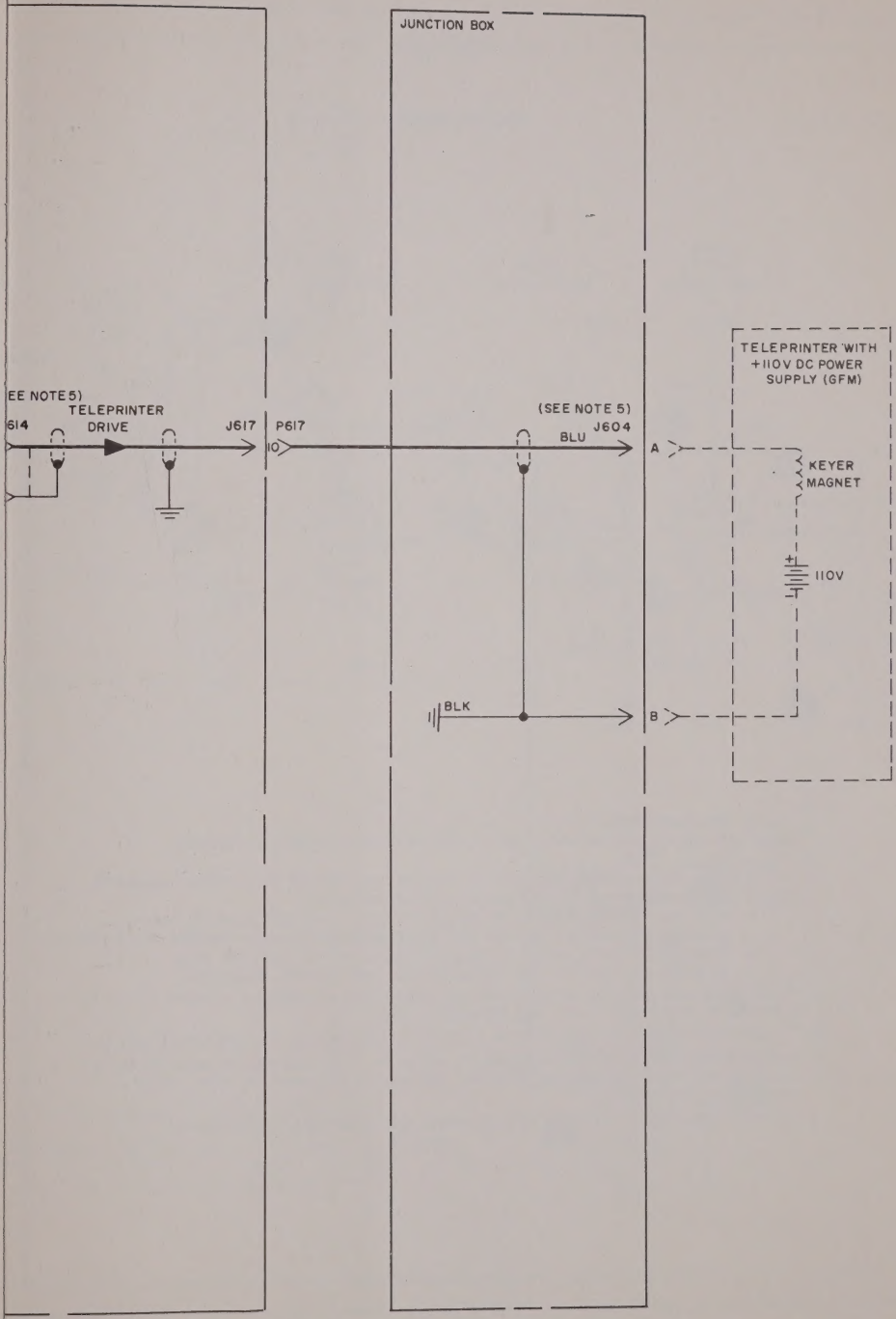


NOTES:

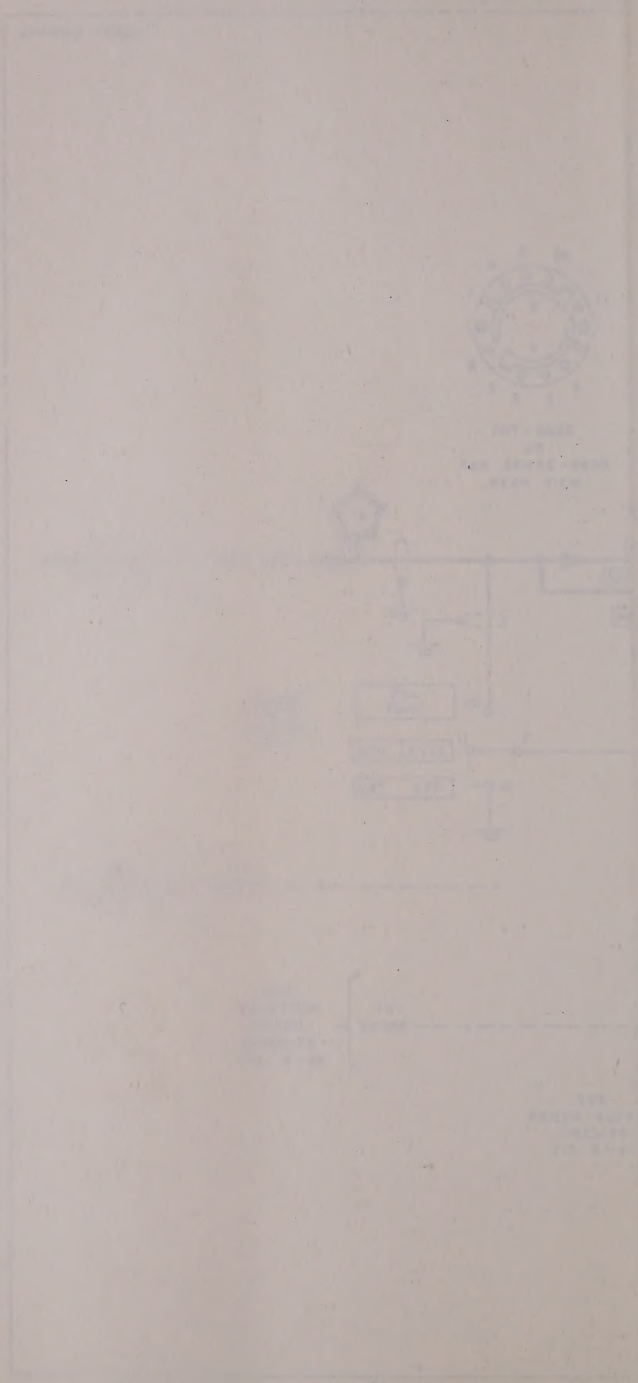
1. UNLESS OTHERWISE SPECIFIED:
   RESISTANCE VALUES ARE EXPRESSED IN OHMS,
   1/2 WATT; CAPACITANCE VALUES ARE EXPRESSED IN MICROFARADS.
2. FACTORY ADJUSTMENT VALUE GIVEN IS APPROXIMATE. WHEN DISCRIMINATOR IS REPLACED IN FIELD, USE NOMINAL VALUE STAMPED ON DISCRIMINATOR UNIT.
3. WITH FSK SWITCH IN HOLD, CRT SWITCH IN FSK FINE TUNE, AND V503 REMOVED, R521 IS ADJUSTED TO CENTER TRACE ON CRT. ALL VOLTAGES SHOWN ARE THEN APPROXIMATE AND MUST BE MEASURED WITH A DC VTVM.
4. * THE VOLTAGES GIVEN IN THIS SCHEMATIC OCCUR WITH V503 REMOVED FOR TEST. THE VOLTAGES MUST BE MEASURED WITH A DC VTVM.
5. THE CRT ADJUSTMENT (SEE NOTE 3 ABOVE) MUST BE PERFORMED IF V504 IS REPLACED.
6. UNLESS OTHERWISE NOTED ALL COMPONENTS SHOWN ON THIS DRAWING ARE MOUNTED ON OR IN THE IMMEDIATE AREA OF TERMINAL BOARDS T8501 AND T8502. (FP) INDICATES MOUNTING ON FRONT PANEL.
7. RELATIVE LOCATIONS OF CONTACTS ON CONNECTORS ARE ILLUSTRATED IN FIGURE 6-42.

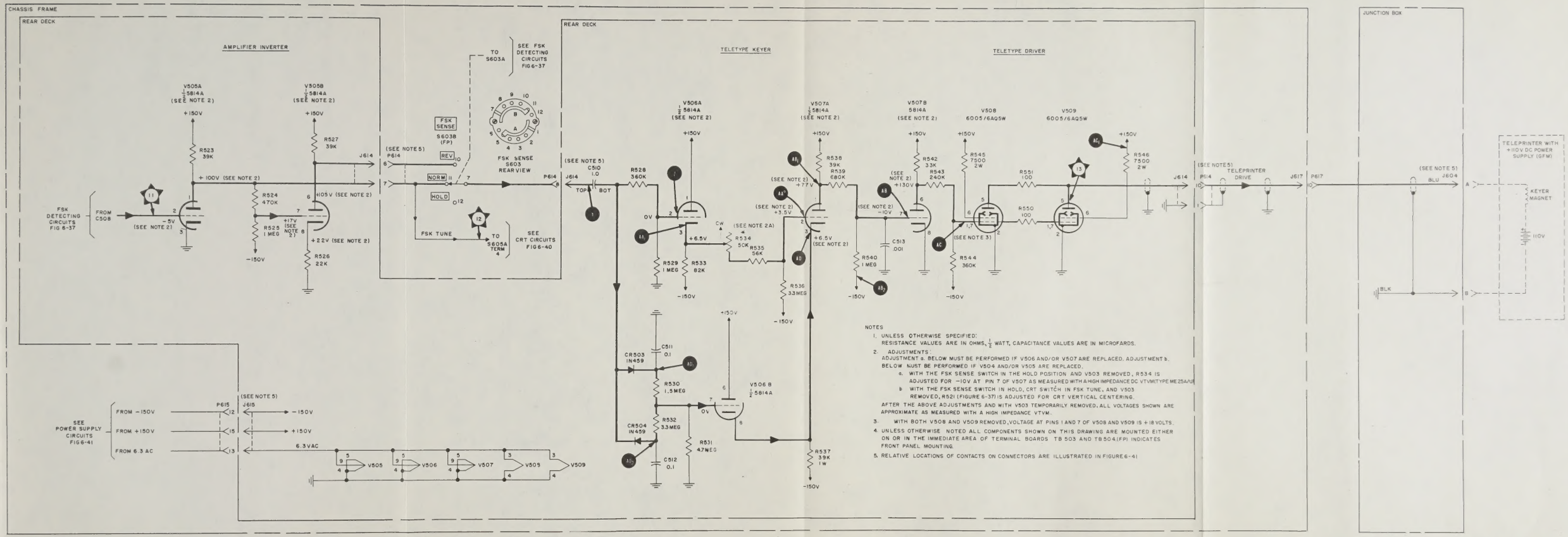
Figure 6-37. Radio Receiving Set AN/BRR-3 FSK Detecting Circuits, Schematic Diagram





re 6-38. Radio Receiving Set AN/BRR-3 Teletype Keyer Circuits, Schematic Diagram



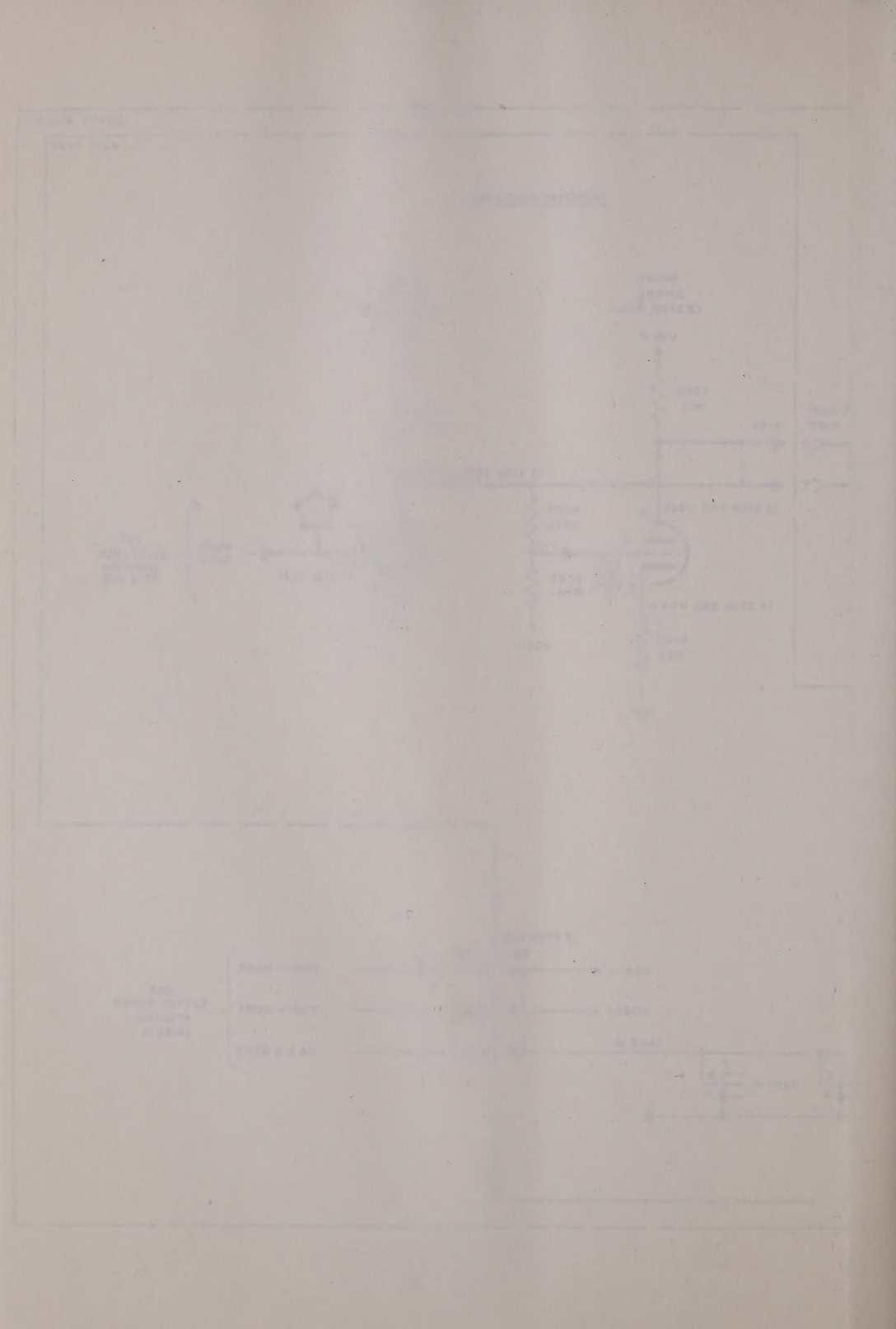


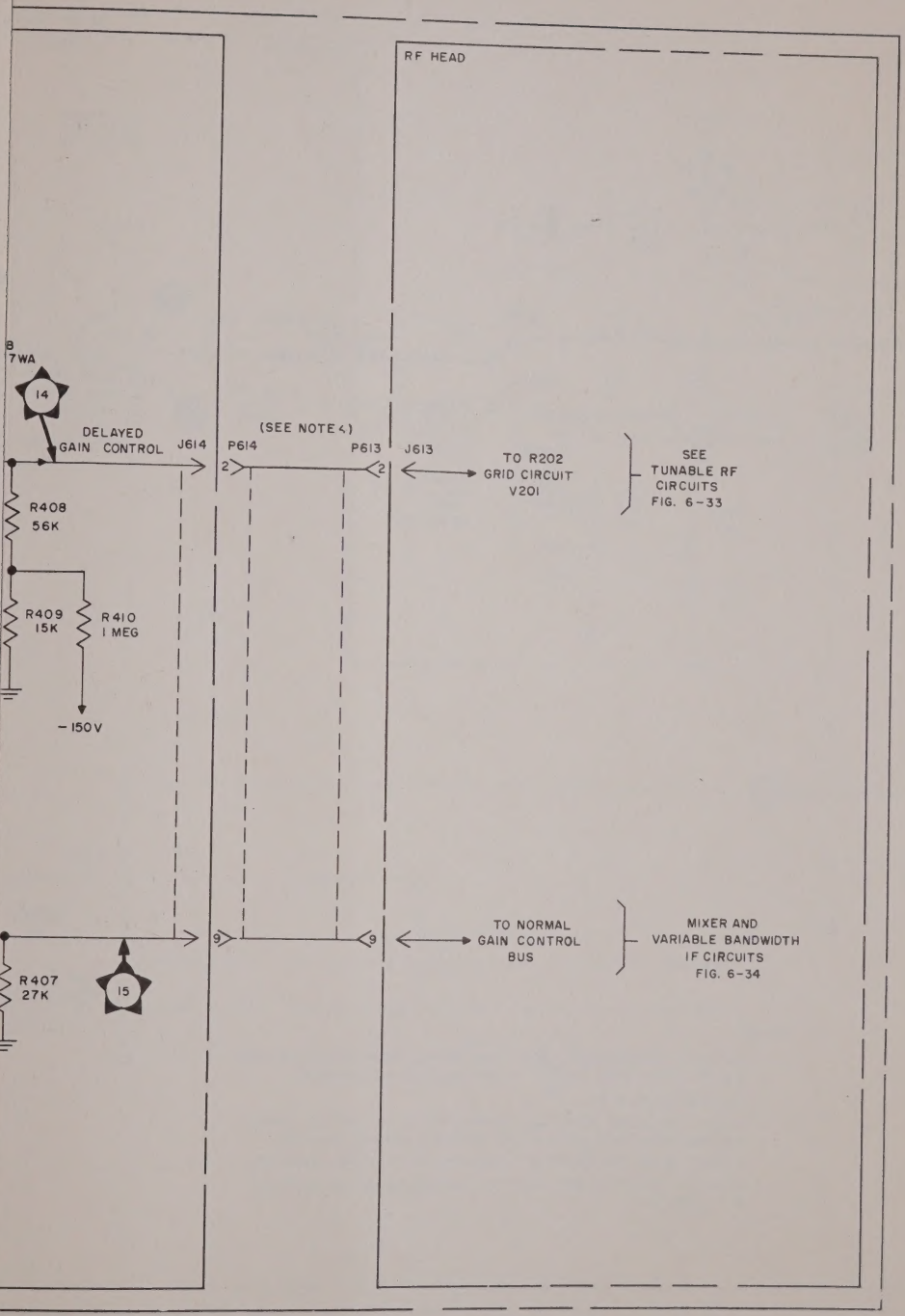
NOTES

1. UNLESS OTHERWISE SPECIFIED:
   RESISTANCE VALUES ARE IN OHMS, 1/2 WATT, CAPACITANCE VALUES ARE IN MICROFARDS.
2. ADJUSTMENTS:
   ADJUSTMENT a. BELOW MUST BE PERFORMED IF V506 AND/OR V507 ARE REPLACED. ADJUSTMENT b. BELOW MUST BE PERFORMED IF V504 AND/OR V505 ARE REPLACED.
   a. WITH THE FSK SENSE SWITCH IN THE HOLD POSITION AND V503 REMOVED, R534 IS ADJUSTED FOR -10V AT PIN 7 OF V507 AS MEASURED WITH A HIGH IMPEDANCE DC VTVM (TYPE ME 25A/U).
   b. WITH THE FSK SENSE SWITCH IN HOLD, CRT SWITCH IN FSK TUNE, AND V503 REMOVED, R521 (FIGURE 6-37) IS ADJUSTED FOR CRT VERTICAL CENTERING.

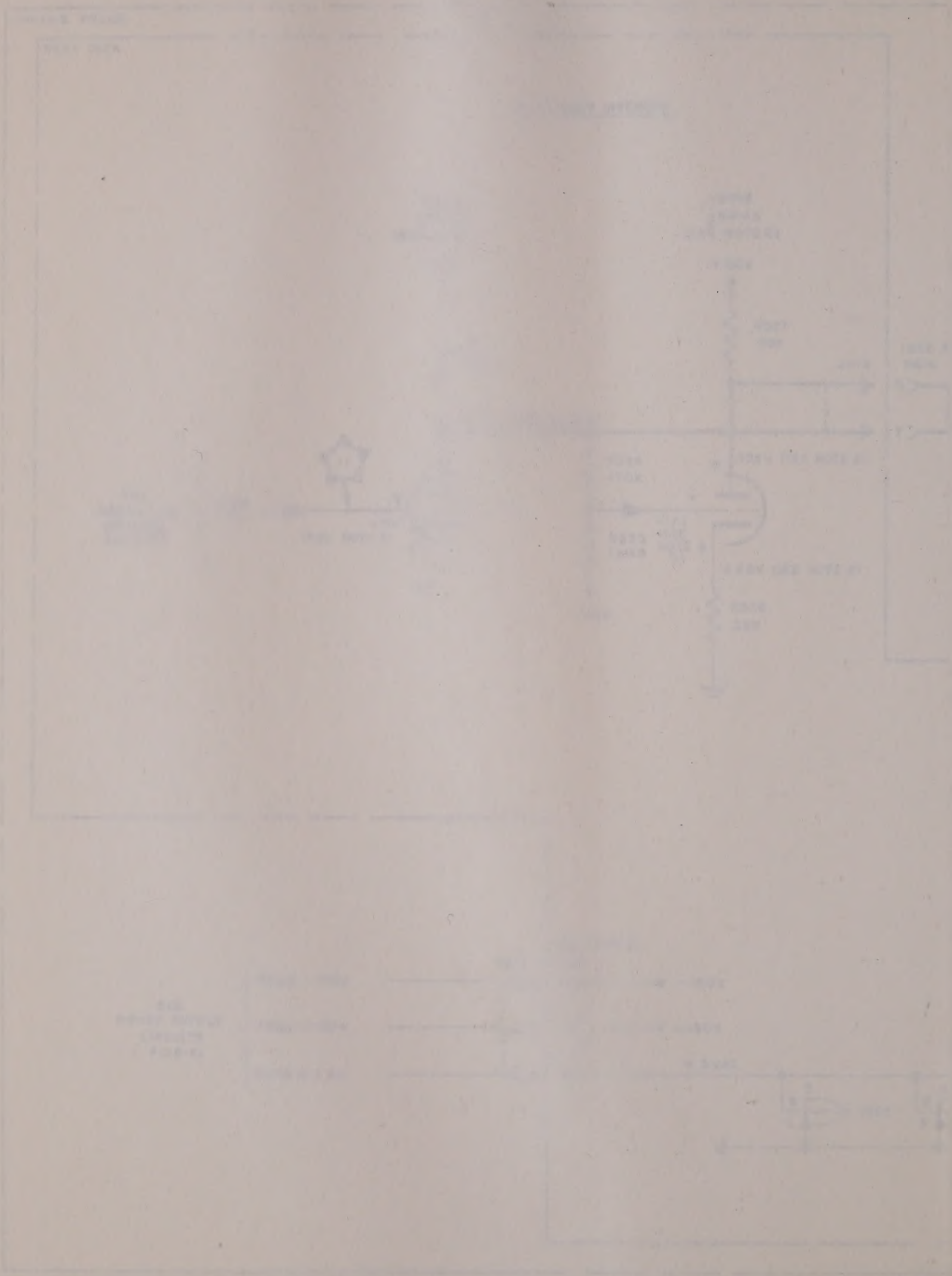
   AFTER THE ABOVE ADJUSTMENTS AND WITH V503 TEMPORARILY REMOVED, ALL VOLTAGES SHOWN ARE APPROXIMATE AS MEASURED WITH A HIGH IMPEDANCE VTVM.
3. WITH BOTH V508 AND V509 REMOVED, VOLTAGE AT PINS 1 AND 7 OF V508 AND V509 IS +18 VOLTS.
4. UNLESS OTHERWISE NOTED ALL COMPONENTS SHOWN ON THIS DRAWING ARE MOUNTED EITHER ON OR IN THE IMMEDIATE AREA OF TERMINAL BOARDS TB 503 AND TB 504 (FP) INDICATES FRONT PANEL MOUNTING.
5. RELATIVE LOCATIONS OF CONTACTS ON CONNECTORS ARE ILLUSTRATED IN FIGURE 6-41

Figure 6-38. Radio Receiving Set AN/BRR-3 Teletype Keyer Circuits, Schematic Diagram





ure 6-39. Radio Receiving Set AN/BRR-3 Gain Control Circuit, Schematic Diagram



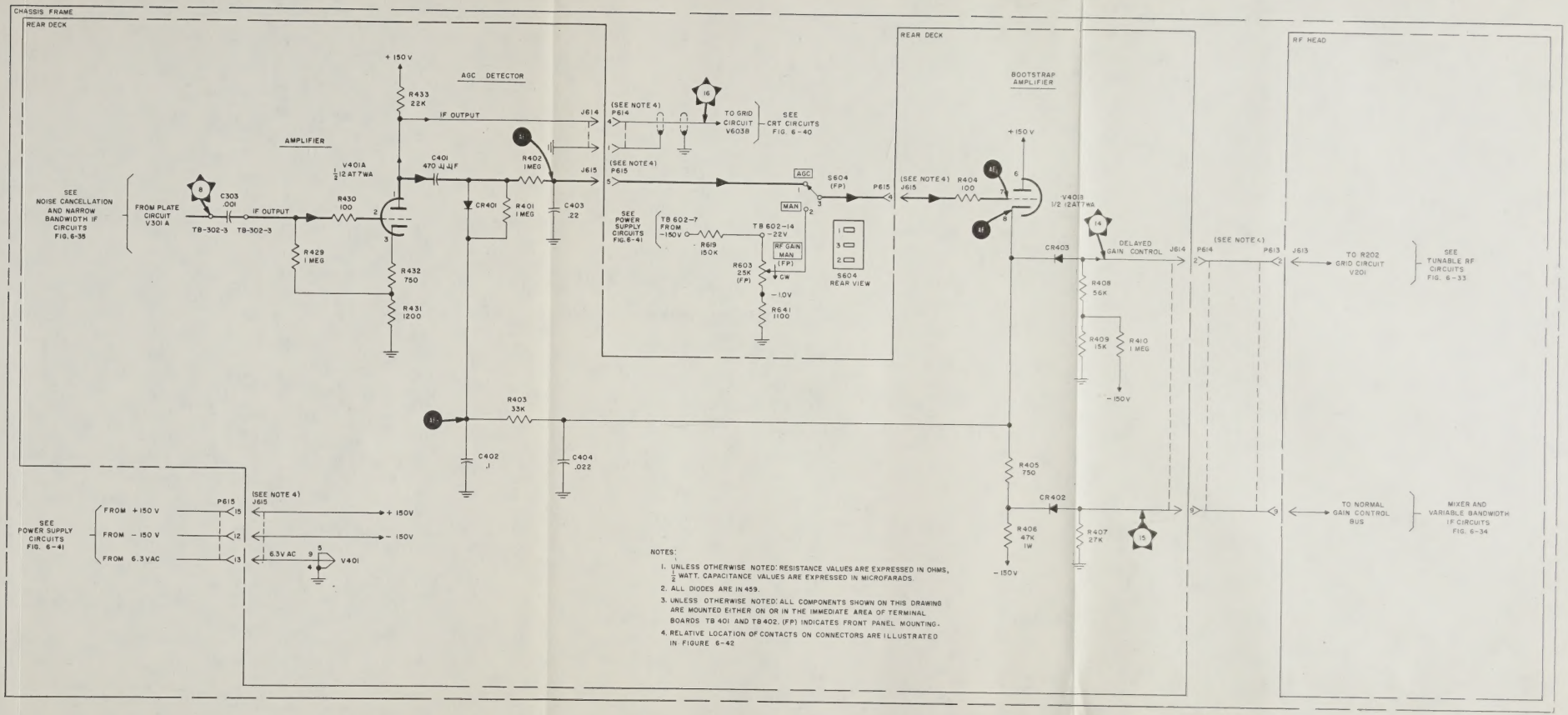
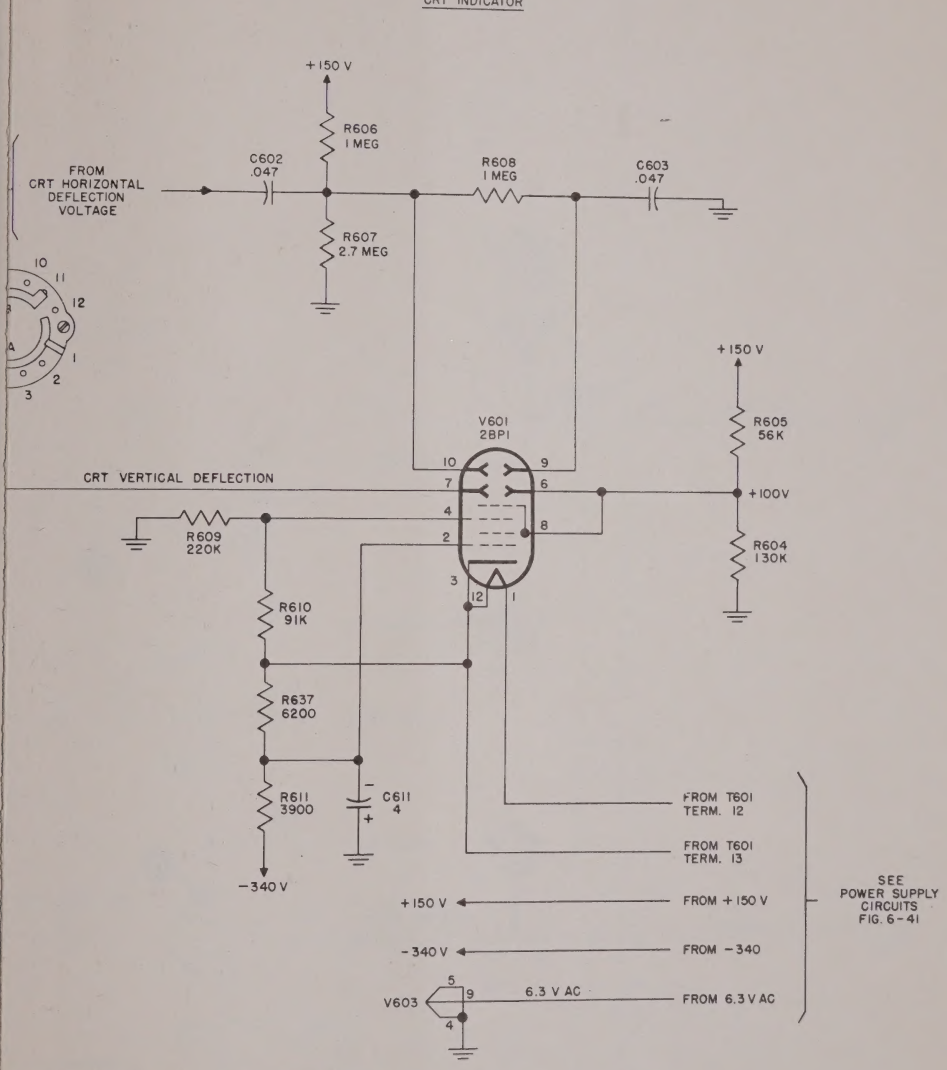


Figure 6-39. Radio Receiving Set AN/BRR-3 Gain Control Circuit, Schematic Diagram



HERWISE SPECIFIED RESISTANCE VALUES ARE EXPRESSED
/2 WATT, AND CAPACITANCE VALUES ARE EXPRESSED IN
DS.

THERWISE NOTED ALL COMPONENTS SHOWN ON THIS
ARE MOUNTED EITHER ON OR IN THE IMMEDIATE AREA OF
BOARDS TB601 AND TB602. (FP) INDICATES FRONT PANEL

LOCATIONS OF CONTACTS ON CONNECTORS ARE ILLUSTRATED
6-42

Figure 6-40. Radio Receiving Set AN/BRR-3 CRT Circuits, Schematic Diagram

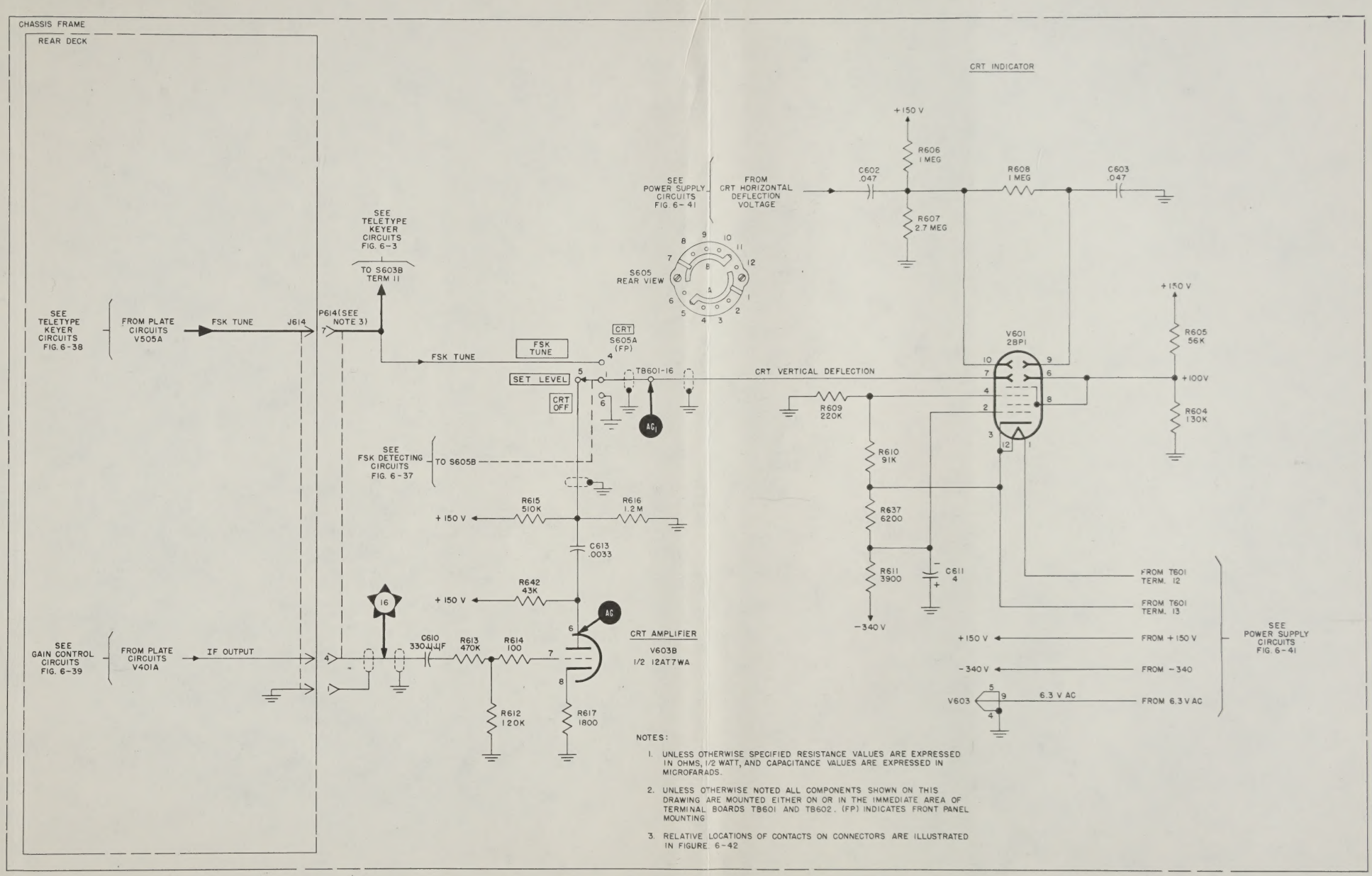
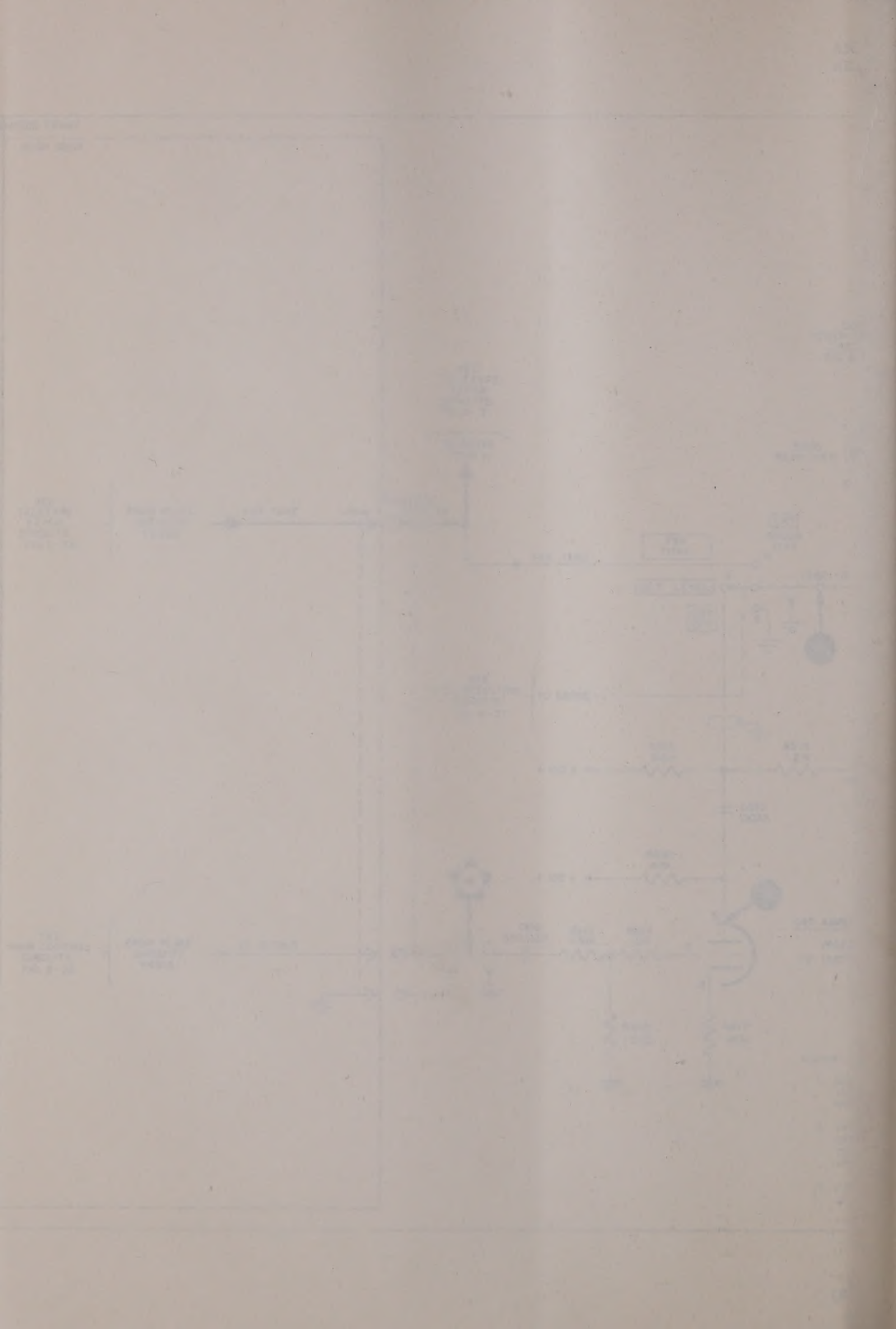
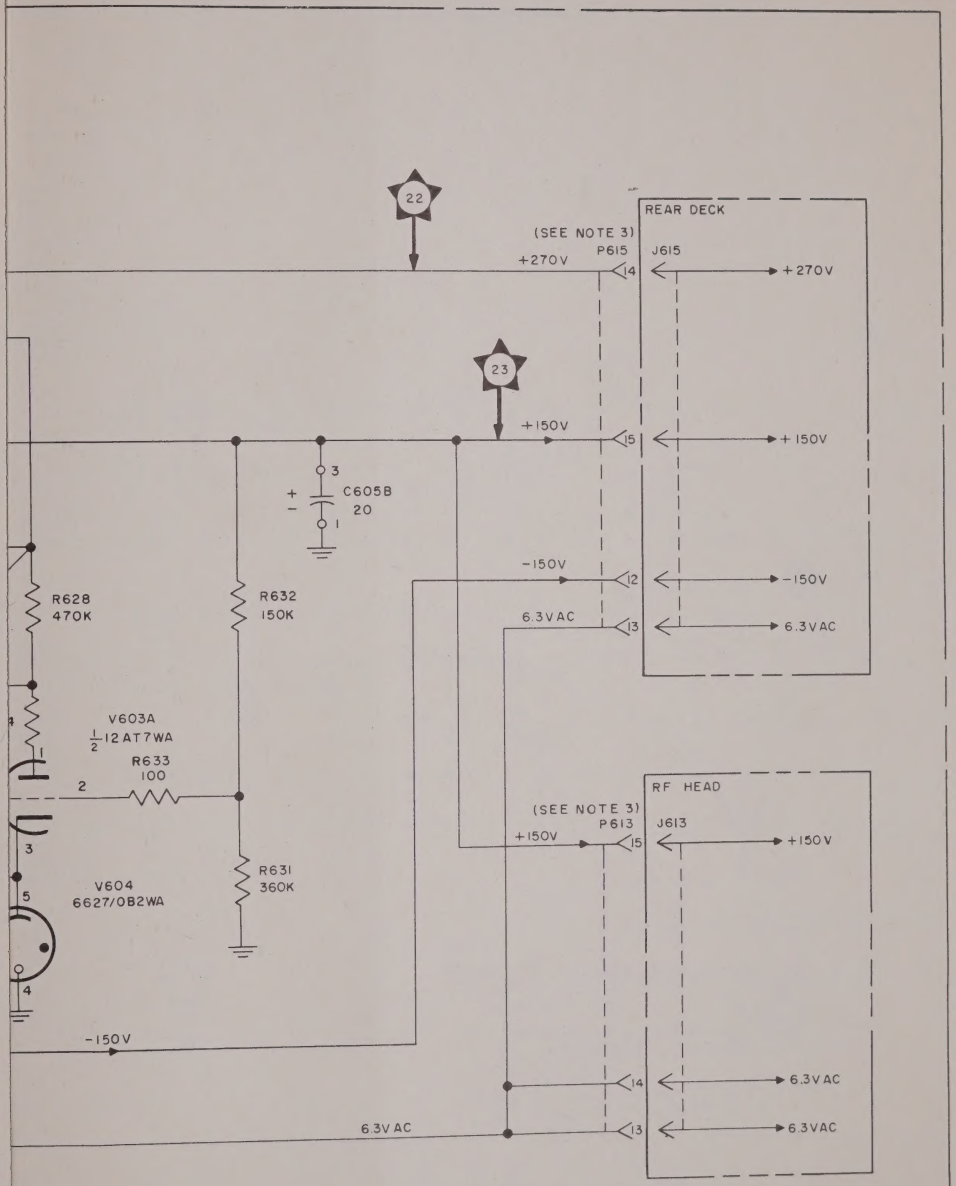
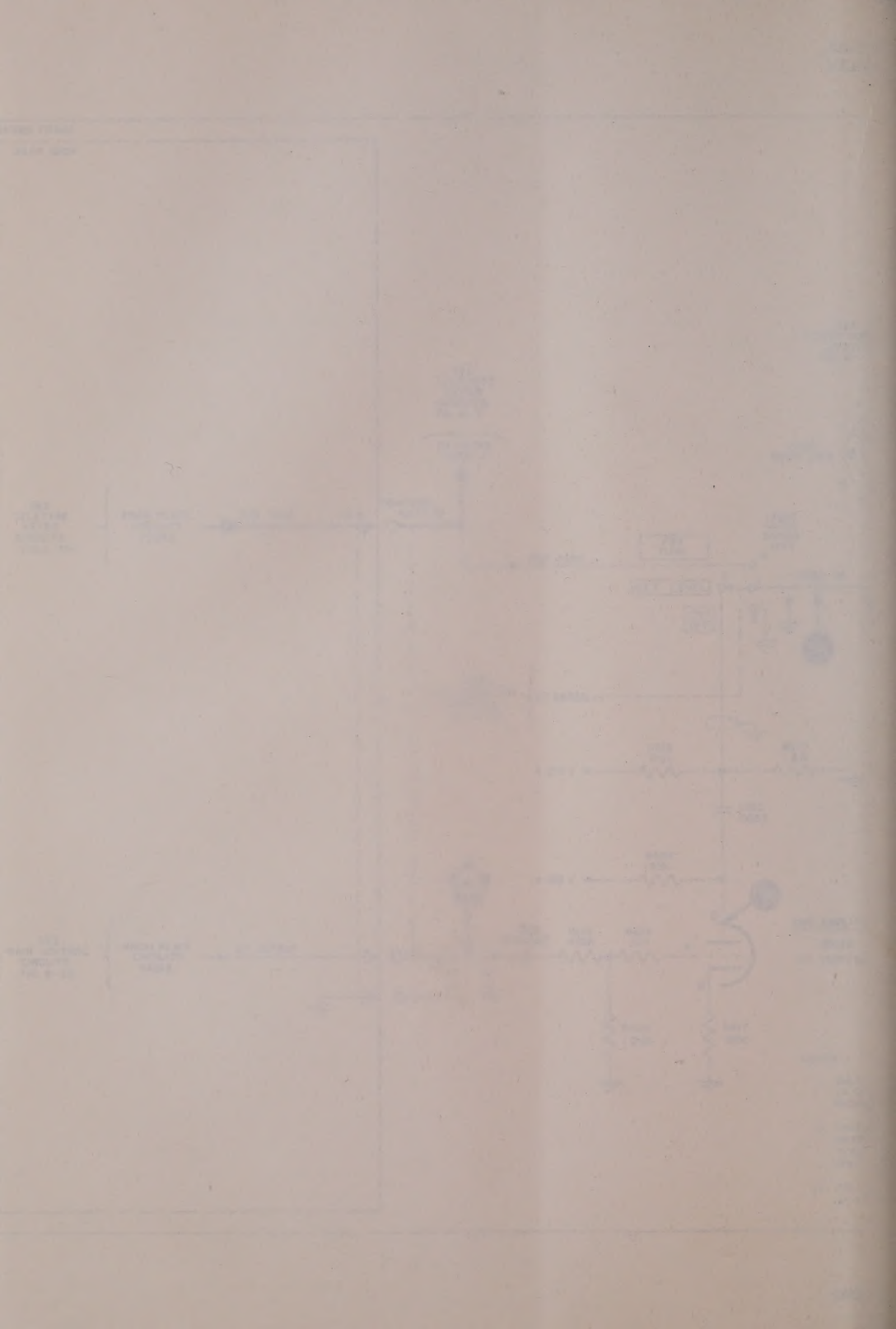


Figure 6-40. Radio Receiving Set AN/BRR-3 CRT Circuits, Schematic Diagram





e 6-41. Radio Receiving Set AN/BRR-3 Power Supply Circuits, Schematic Diagram



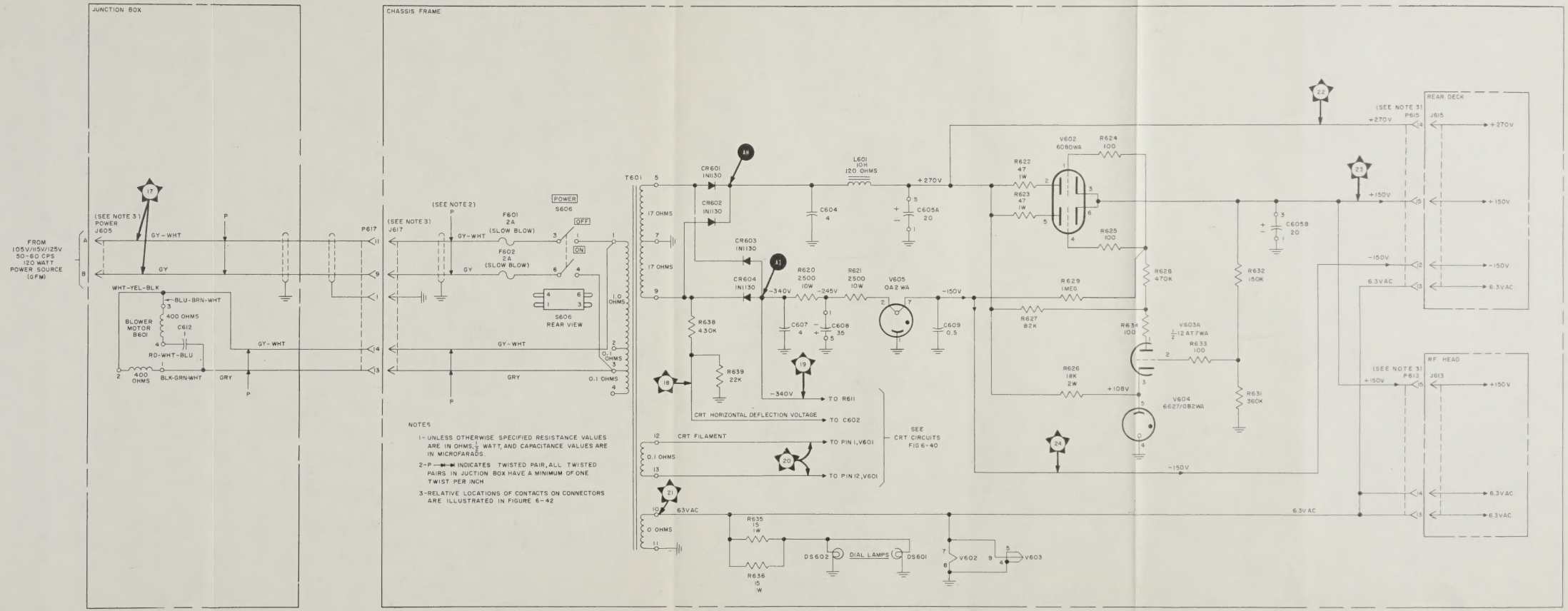
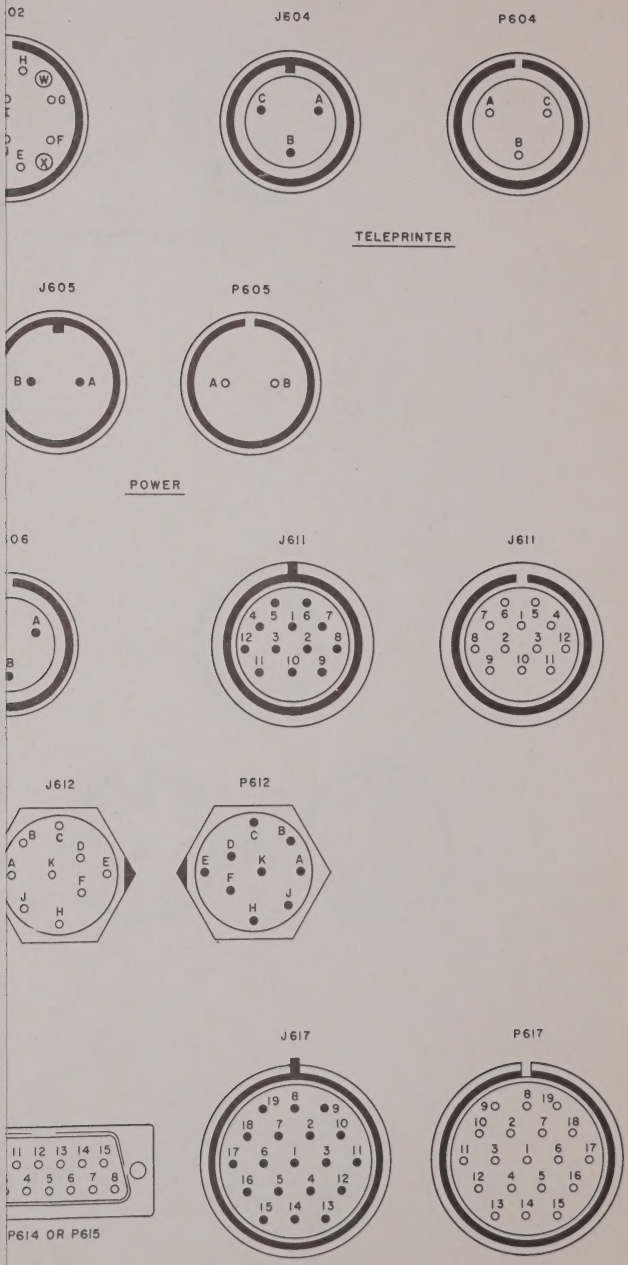


Figure 6-41. Radio Receiving Set AN/BRR-3 Power Supply Circuits, Schematic Diagram



et AN/BRR-3, Location of Contacts on Connectors

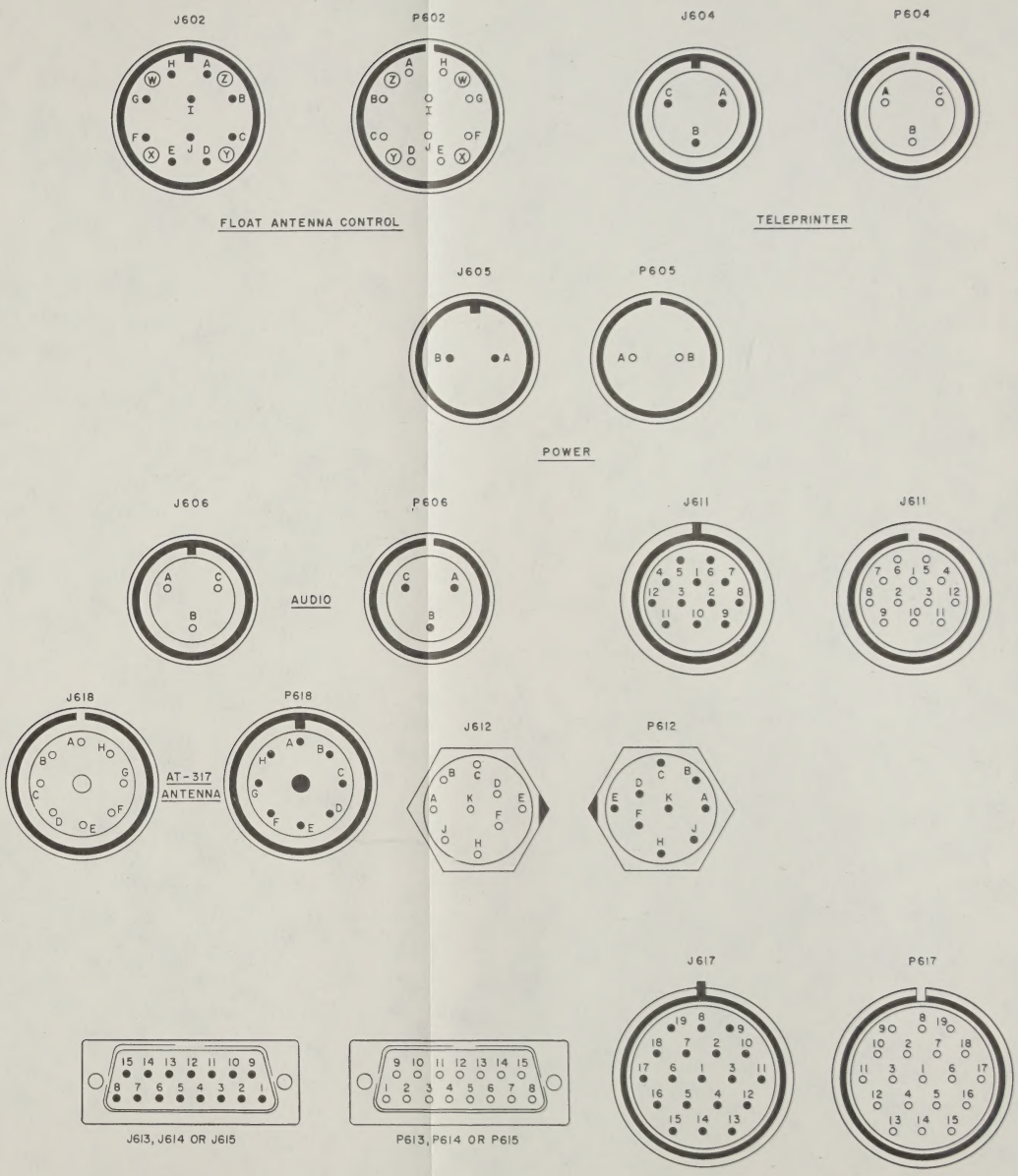


Figure 6-42. Radio Receiving Set AN/BRR-3, Location of Contacts on Connectors

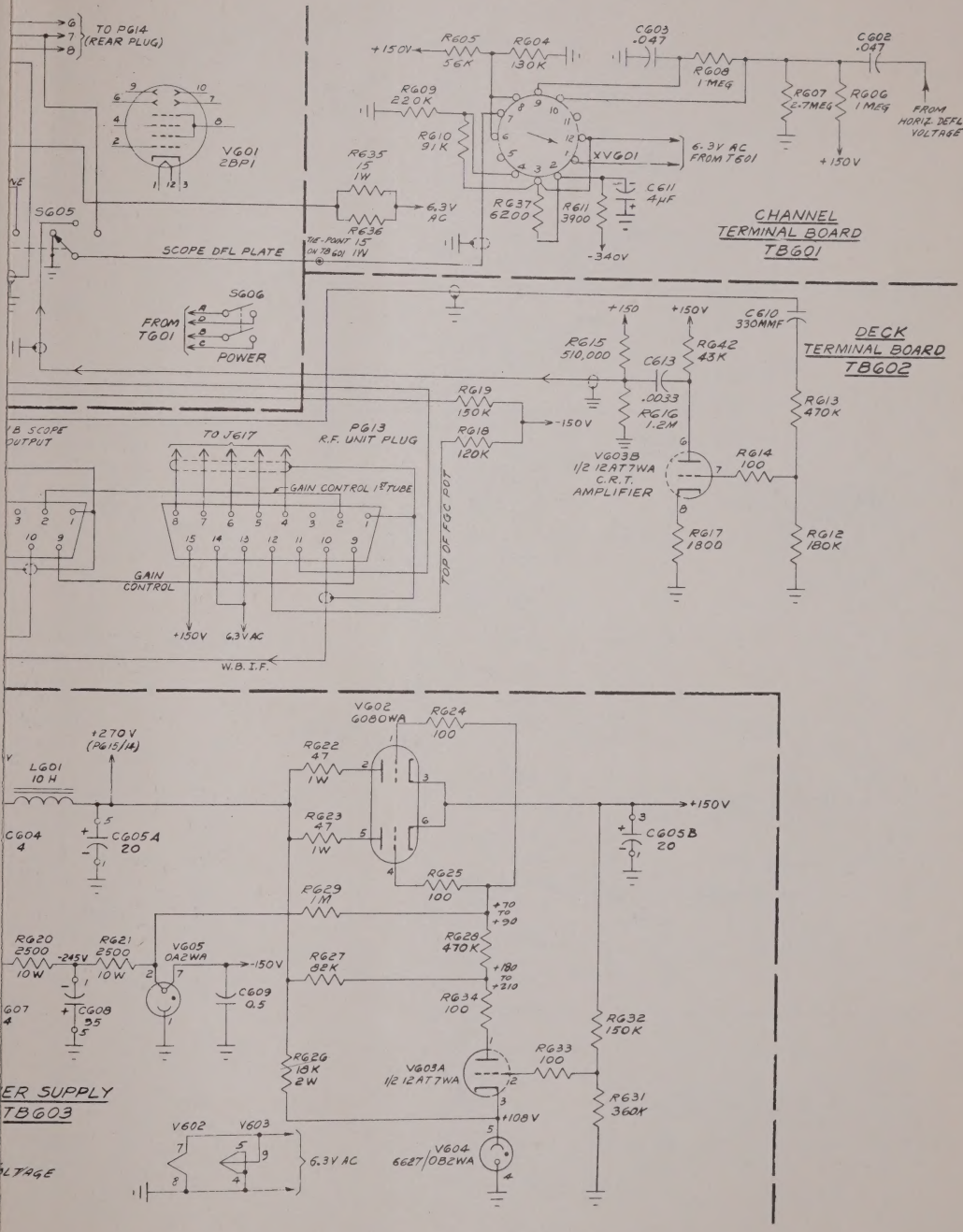


Figure 6-43. Radio Receiving Set AN/BRR-3 Chassis Frame, Schematic Diagram

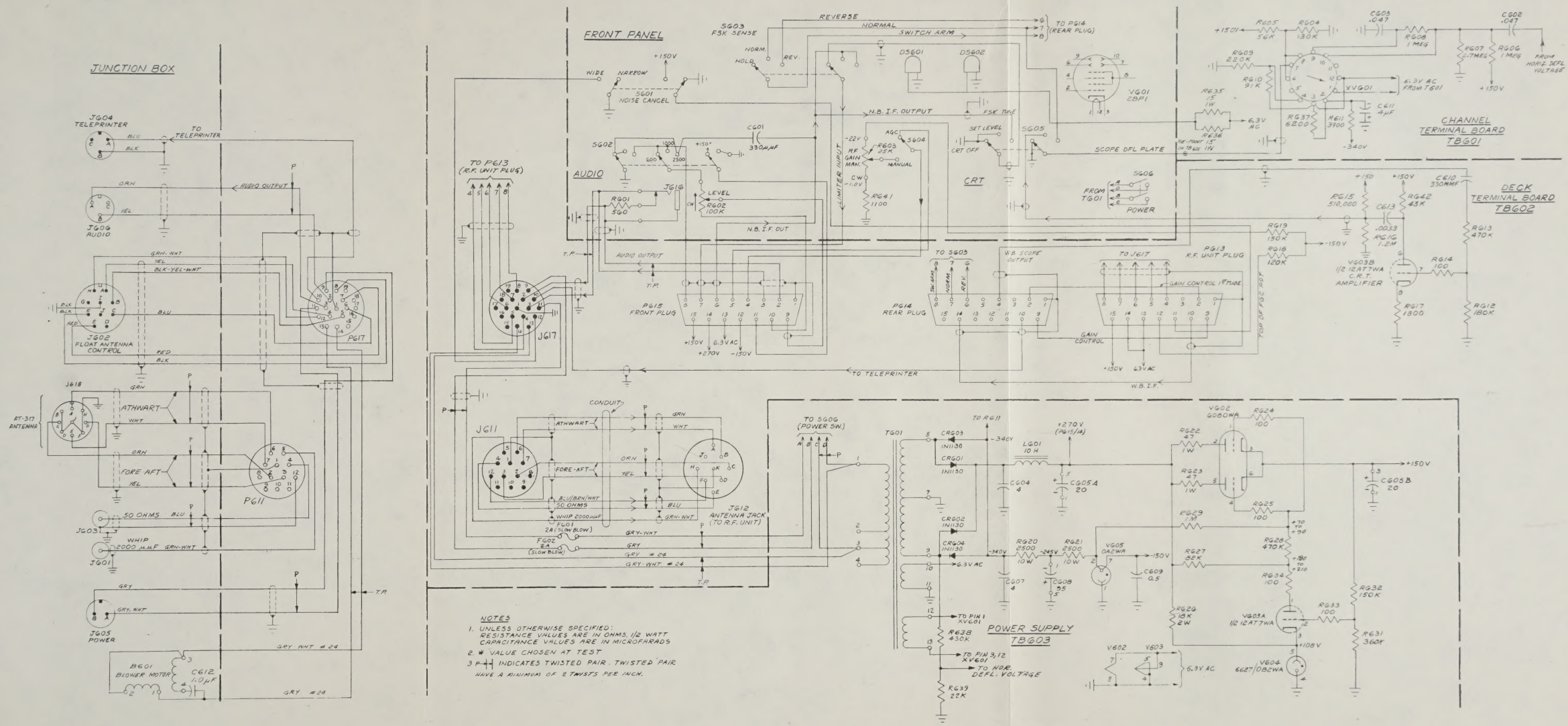
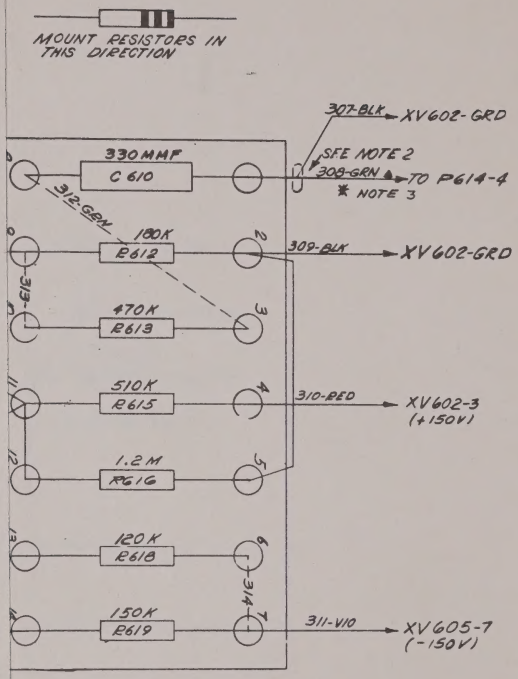


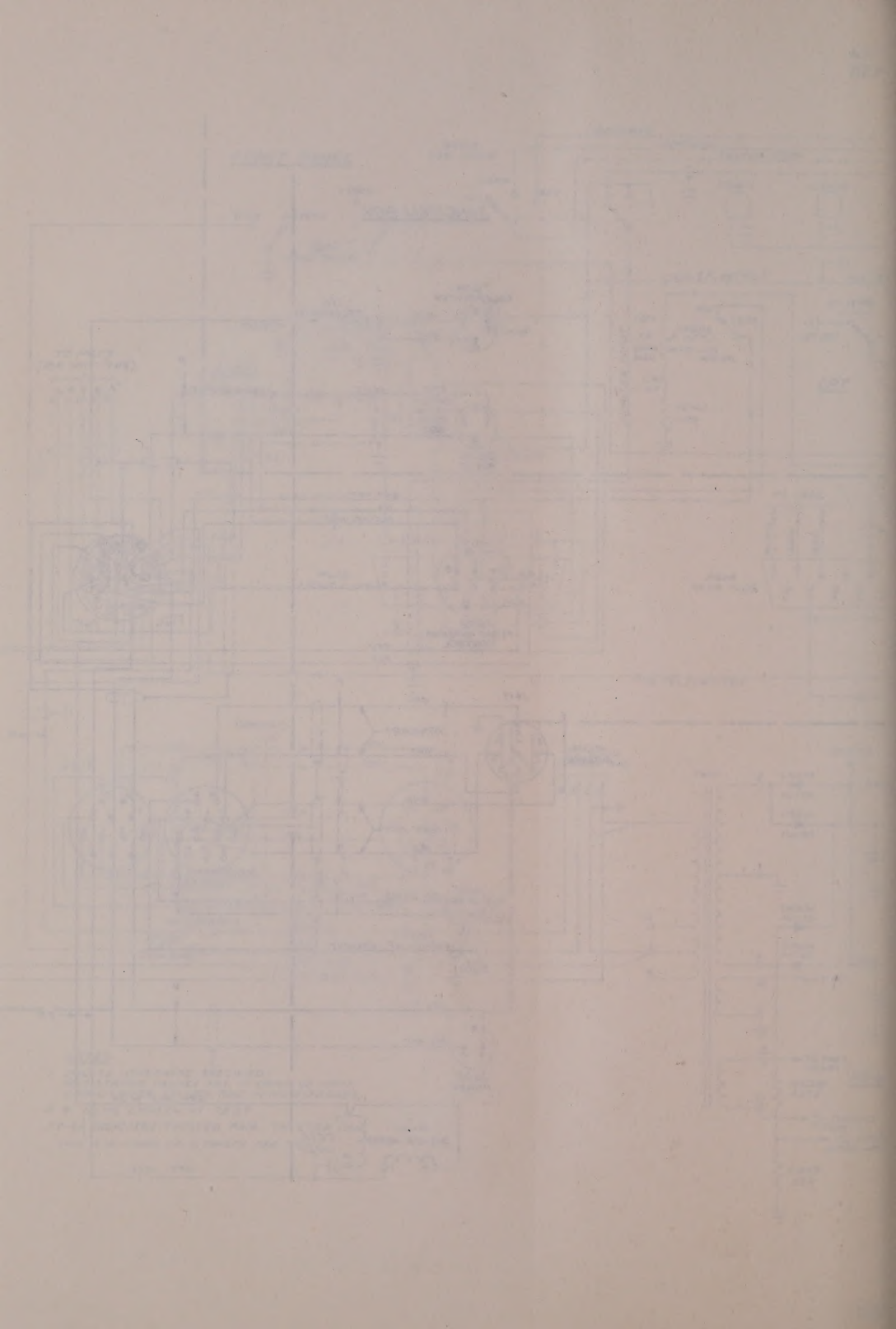
Figure 6-43. Radio Receiving Set AN/BRR-3 Chassis Frame, Schematic Diagram

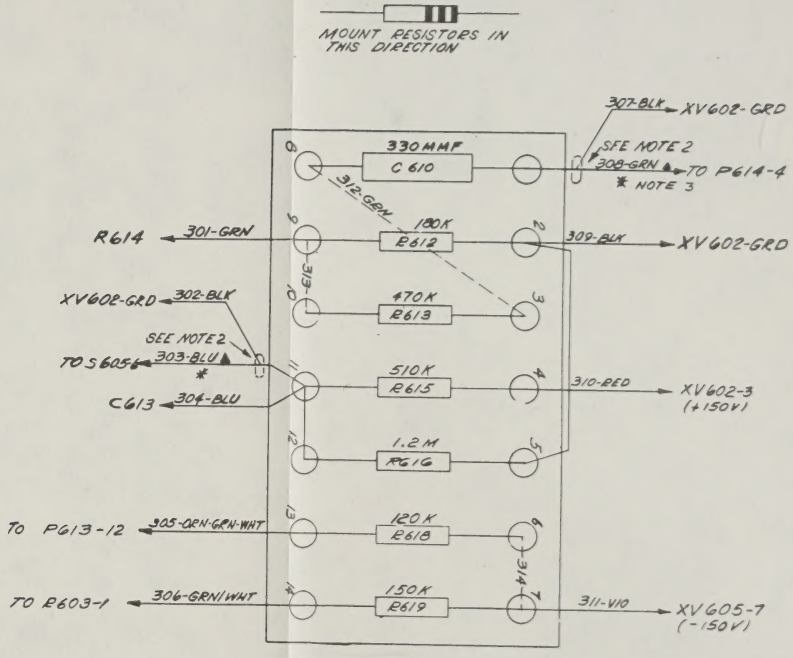


602-1	—	
602-2	—	
602-3	—	
602-4	—	
602-6	—	
602-7	—	
02-5		
	4"	15
	6"	15
02-7	1"	12
2-10	1"	12
-3	2½"	8
05-7	4"	11
2-3	8¾"	9
-GRD	3¾"	10
4-4	24"	14
-GRD	4"	10
3-1	15"	6
3-12	24"	7
⊗	5½"	5
5-6	15"	13
-GRD	2½"	10
⊗	5½"	8
	LENGTH	ITEM #

NOTES:
1. ▲ - INDICATES SHIELDED WIRE
2. STRIP SHIELD ½ FROM BOARD SOLDER BLACK WIRE TO SHIELD APPROX ½ FROM BOARD PUSH SLEEVING OVER SHIELD AND CONNECTED END OF BLACK WIRE TO WITHIN ⅛ OF THE BOARD SECURE SLEEVING IN PLACE WITH TAPE ITEM
3. * - INDICATES SLEEVING ON WIRE
4. WIRE TERMINATIONS INDICATED BY → ARE TO BE MADE AFTER BOARD IS CHASSIS MOUNTED.

TB 602, Wiring Diagram



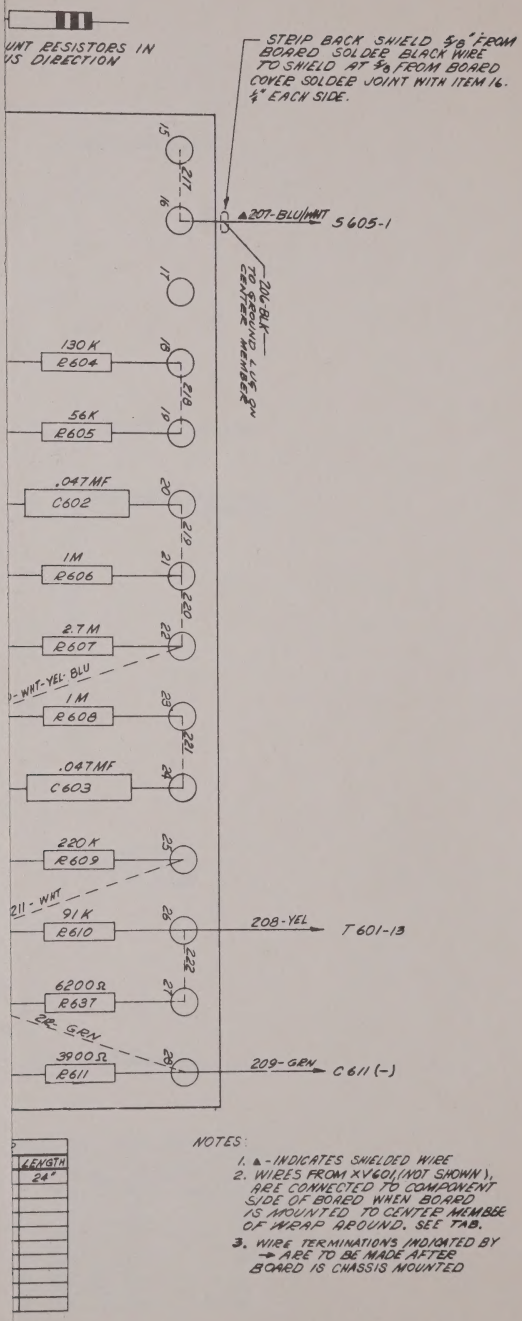


—	C610	TB602-8		TB602-1	—	
—	R612	TB602-9		TB602-2	—	
—	R613	TB602-10		TB602-3	—	
—	R615	TB602-11		TB602-4	—	
—	R618	TB602-13		TB602-6	—	
—	R619	TB602-14		TB602-7	—	
—	R616	TB602-12		TB602-5		
308	SLEEVE	TB 602-1		—	4"	15
308	SLEEVE	TB 602-11		—	8"	15
314	BUSS	TB 602-6		TB 602-7	1"	12
313	BUSS	TB 602-9		TB602-10	1"	12
312	GRN	TB 602-8		TB602-3	2½"	8
311	VIO	TB 602-7		XV605-7	4"	11
310	RED	TB 602-4		XV602-3	8¾"	9
309	BLK	TB 602-2		XV602-GRD	3¾"	10
*308	GRN (SM)	TB 602-1	A	P614-4	24"	14
307	BLK	SHLD OF 308		XV602-GRD	4"	10
306	GRN-WHT	TB 602-14	BKGN	R603-1	45"	6
305	ORN-GRN-WHT	TB 602-13	BKGN	P613-12	24"	7
304	BLU	TB 602-11		R616 ⊗	5½"	5
*303	BLU (SM)	TB 602-11	BKGN	S605-6	45"	13
302	BLK	SHLD OF 303		XV602-GRD	2¼"	10
301	GRN	TB602-9		R614 ⊗	5¼"	8
WIRE & CBL SYMBOL	COLOR AND AWG SIZE	FROM	VIA	TO	LENGTH	ITEM #

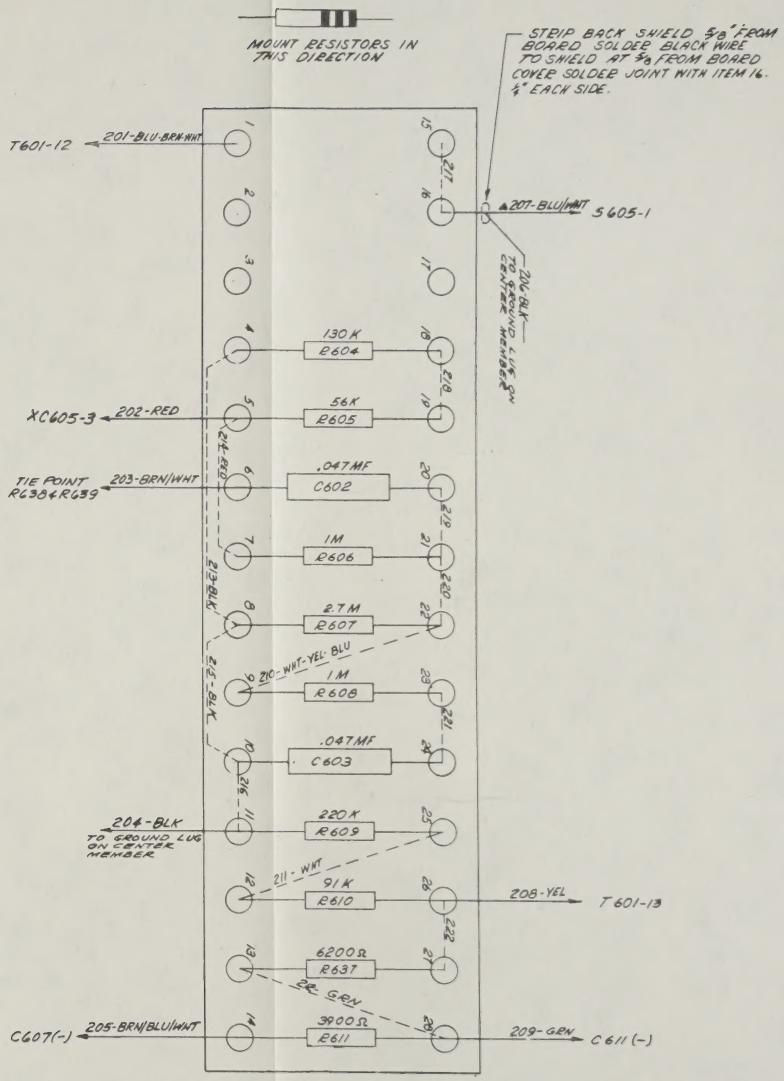
⊗ TIED TO STANDOFF

NOTES:
1. ▲ - INDICATES SHIELDED WIRE
2. STRIP SHIELD ½ FROM BOARD SOLDER BLACK WIRE TO SHIELD APPROX ½ FROM BOARD PUSH SLEEVING OVER SHIELD AND CONNECTED END OF BLACK WIRE TO WITHIN ⅛ OF THE BOARD SECURE SLEEVING IN PLACE WITH TAPE ITEM
3. * - INDICATES SLEEVING ON WIRE WIRE TERMINATIONS INDICATED BY ⊸ ARE TO BE MADE AFTER BOARD IS CHASSIS MOUNTED.

Figure 6-44. TB 602, Wiring Diagram



6-45. TB601, Wiring Diagram

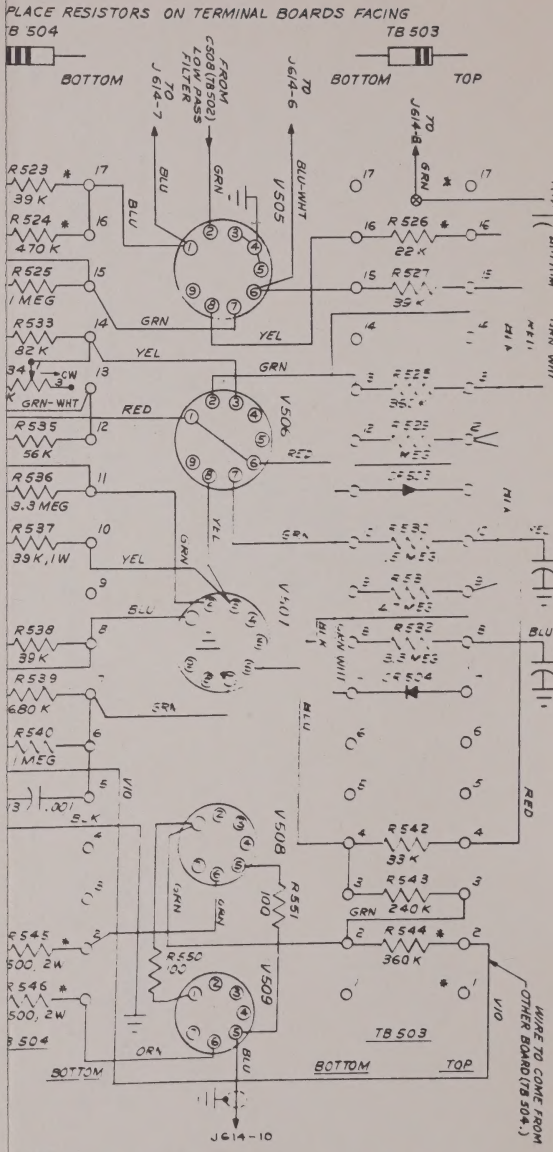


WIRING DATA		SEE NOTE 2	
FROM	TO	COLOR	LENGTH
XV601-1	TB601-1	BLU-BRN-WHT	24"
-2	-28	GRN	
-3	-26	YEL	
-4	-25	WHT	
-6	-18	BLU	
-7	-15	BLU-WHT	
-8	-19	ORN	
-9	-23	RED-WHT-BLU	
-10	-20	WHT-YEL-BLU	
-12	-27	YEL	

NOTES:
1. ▲ - INDICATES SHIELDED WIRE
2. WIRES FROM XV601 (NOT SHOWN), ARE CONNECTED TO COMPONENT SIDE OF BORD WHEN BOARD IS MOUNTED TO CENTER MEMBBE OF WRAP AROUND. SEE TAB.
3. WIRE TERMINATIONS INDICATED BY → ARE TO BE MADE AFTER BOARD IS CHASSIS MOUNTED

Figure 6-45. TB601, Wiring Diagram

Figure 6-46



NOTES

⊗ INDICATES FEEDTHROUGH COMPONENTS MOUNTED IN POSITIONS INDICATED BY

(*) ASTERISKS MUST BE DRESSED TO ALLOW FREE PASSAGE OF THE HEADS OF 6-32 ROUND HEAD SCREWS. SEE DET. A

UNLESS OTHERWISE SPECIFIED: RESISTANCE VALUES ARE IN OHMS. CAPACITANCE VALUES ARE IN MICROFARADS.

TELETYPE OUTPUT
BACK OF RECEIVER

Teletype Connection Diagram

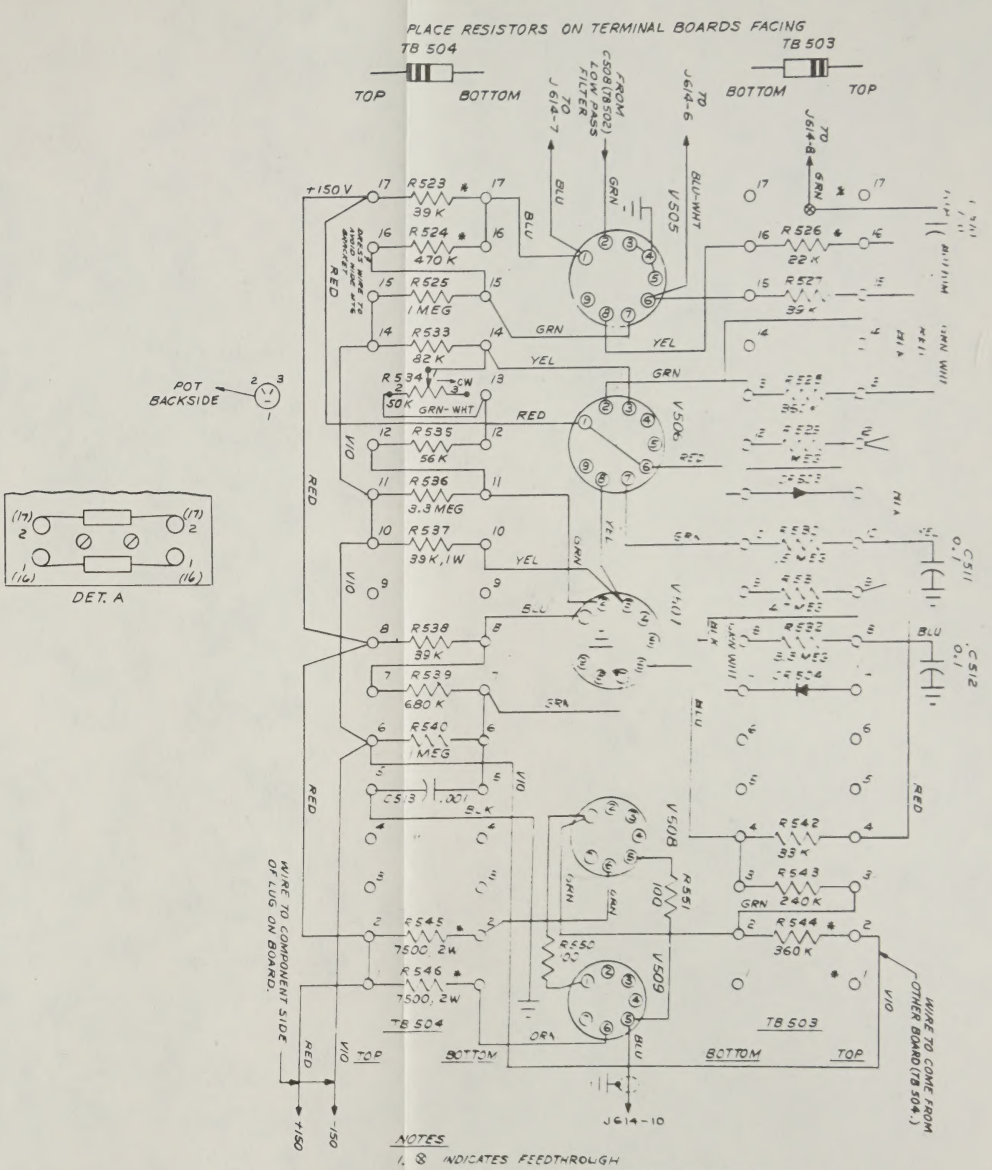
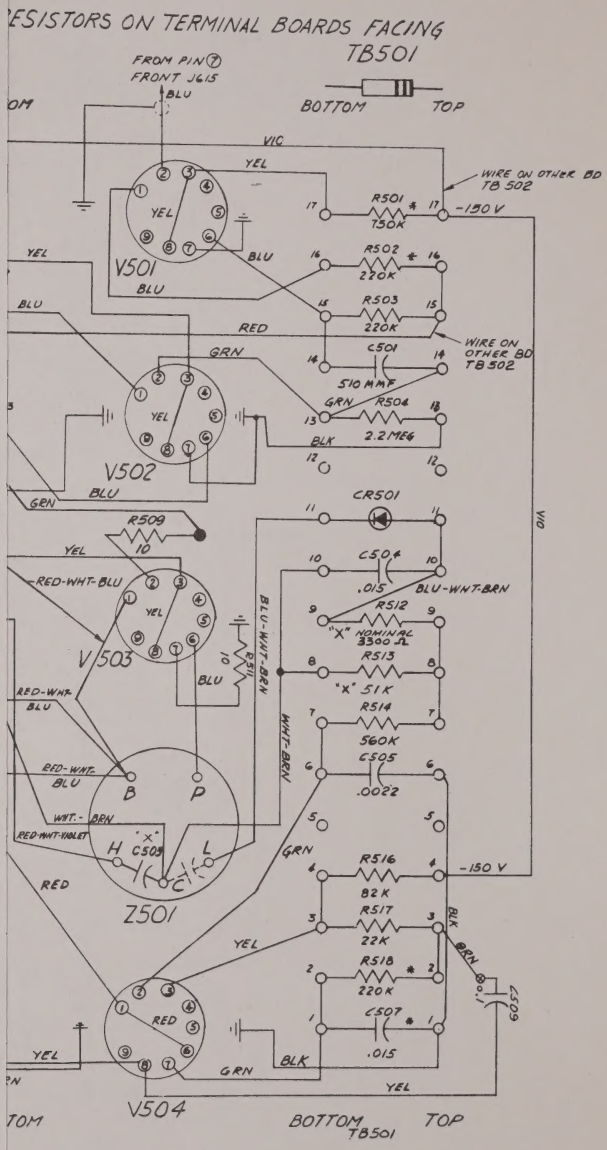
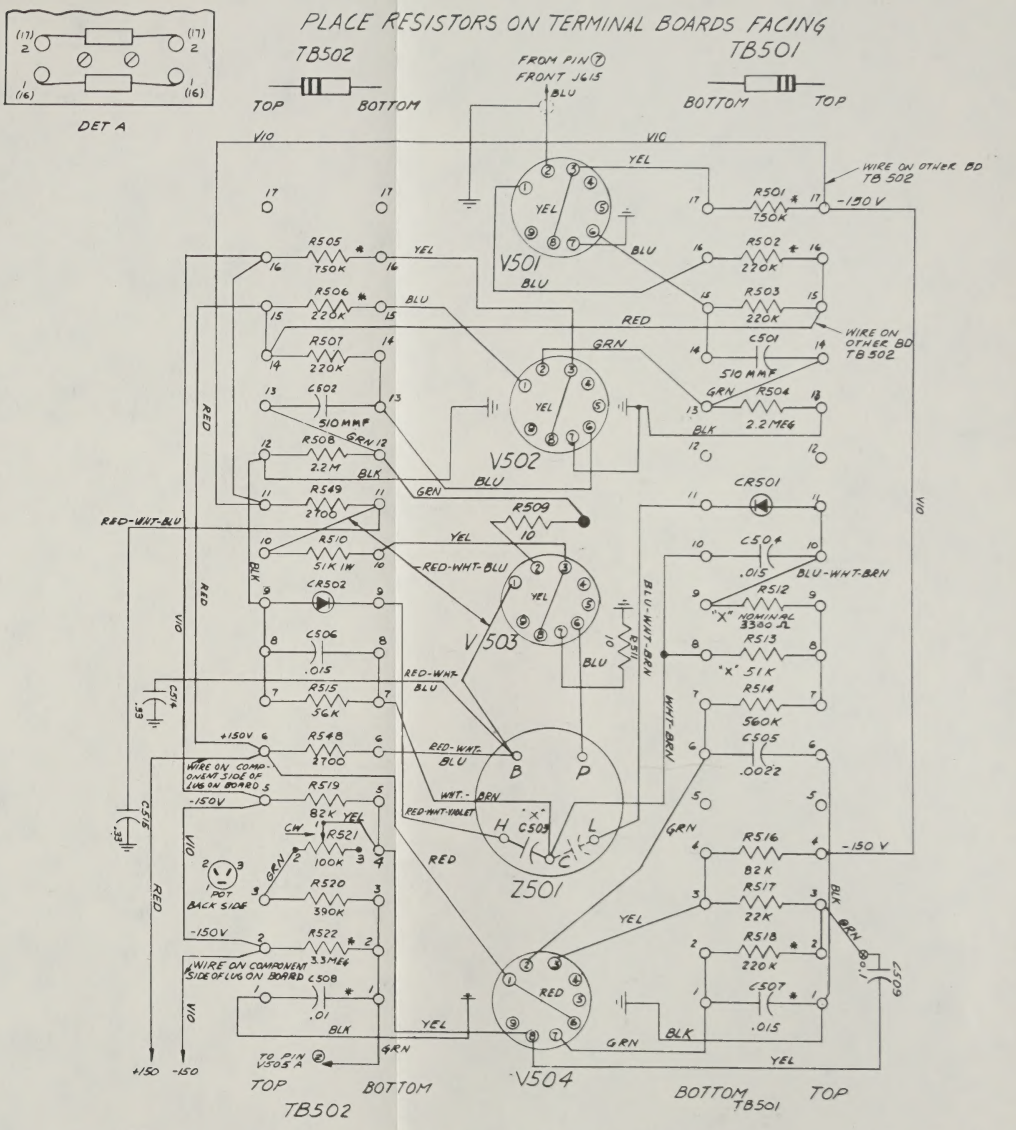


Figure 6-46. Teletype Connection Diagram



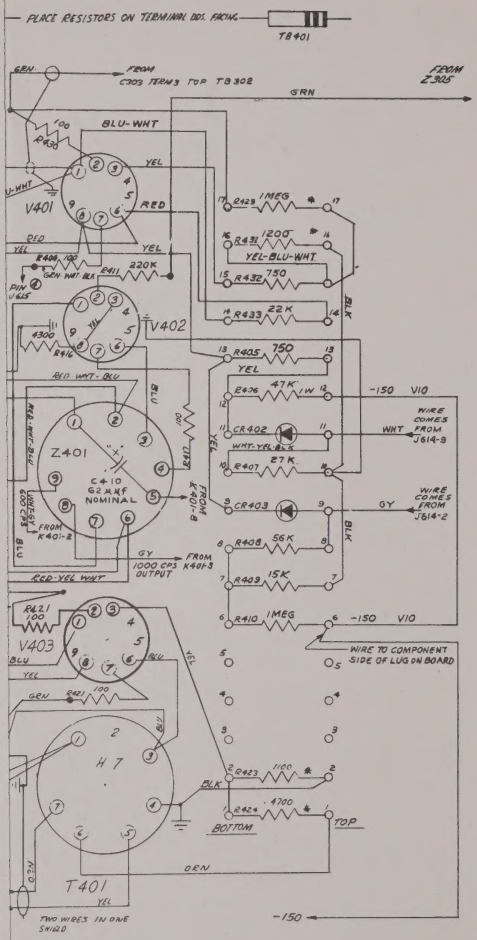
ters and Discriminator, Wiring Diagram



NOTES

1. ⊗ INDICATES FEEDTHROUGH
2. "X" VALUE DETERMINED AT TEST.
3. UNLESS OTHERWISE SPECIFIED: RESISTANCE VALUES ARE IN OHMS. CAPACITANCE VALUES ARE IN MICROFARADS.
4. * COMPONENTS MOUNTED IN POSITIONS INDICATED BY ASTERISK MUST BE DRESSED TO ALLOW FREE PASSAGE OF THE HEADS OF 6-32 RD. HD. SCREWS. SEE DET.A

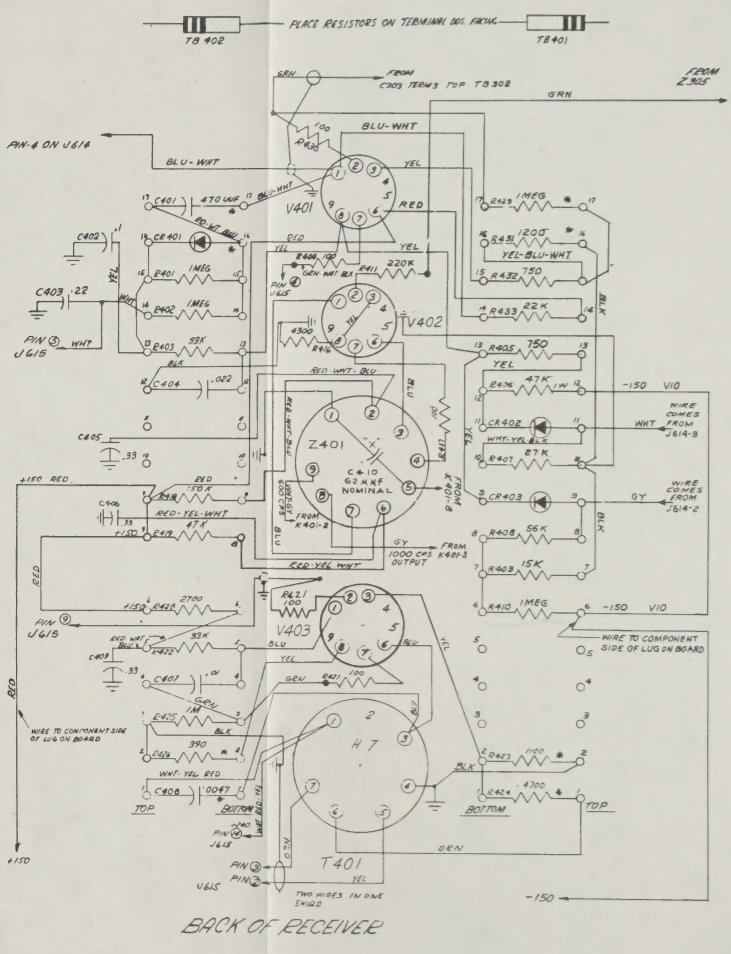
Figure 6-47. Limiters and Discriminator, Wiring Diagram

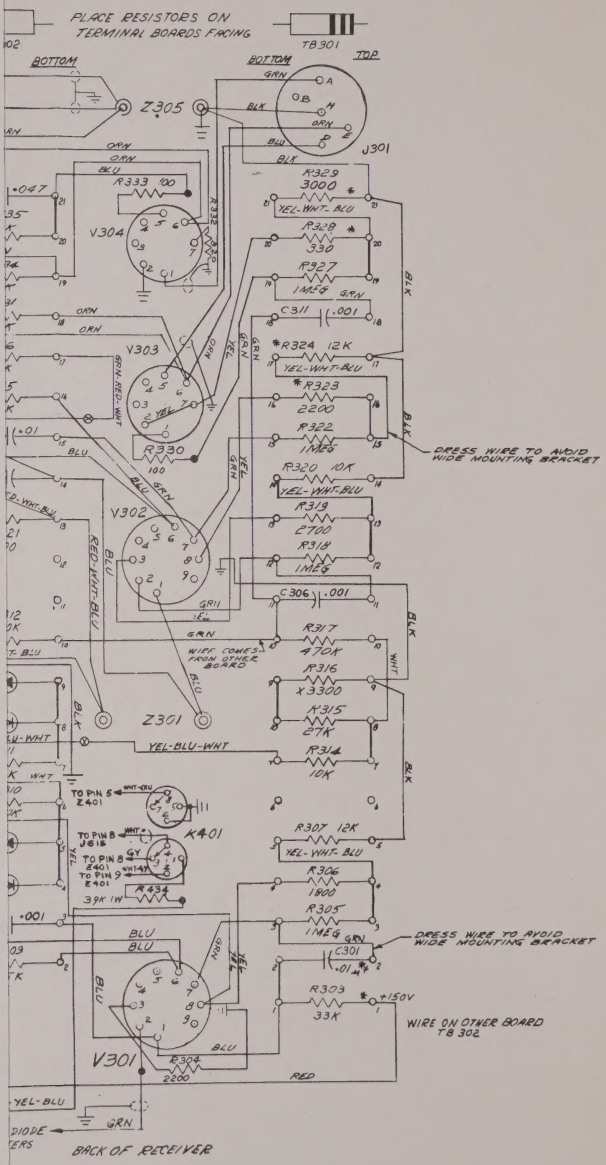


NOTES

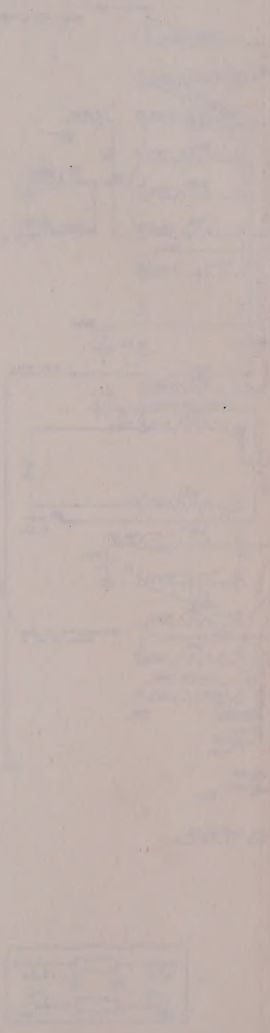
1. * COMPONENTS MOUNTED IN POSITIONS INDICATED BY ASTERISKS MUST BE DRESSED TO ALLOW FREE PASSAGE OF THE HEADS OF G-32 ROUND HEAD SCREWS. SEE DET. A
2. UNLESS OTHERWISE SPECIFIED: RESISTANCE VALUES ARE IN OHMS. CAPACITANCE VALUES ARE IN MICROFARADS.

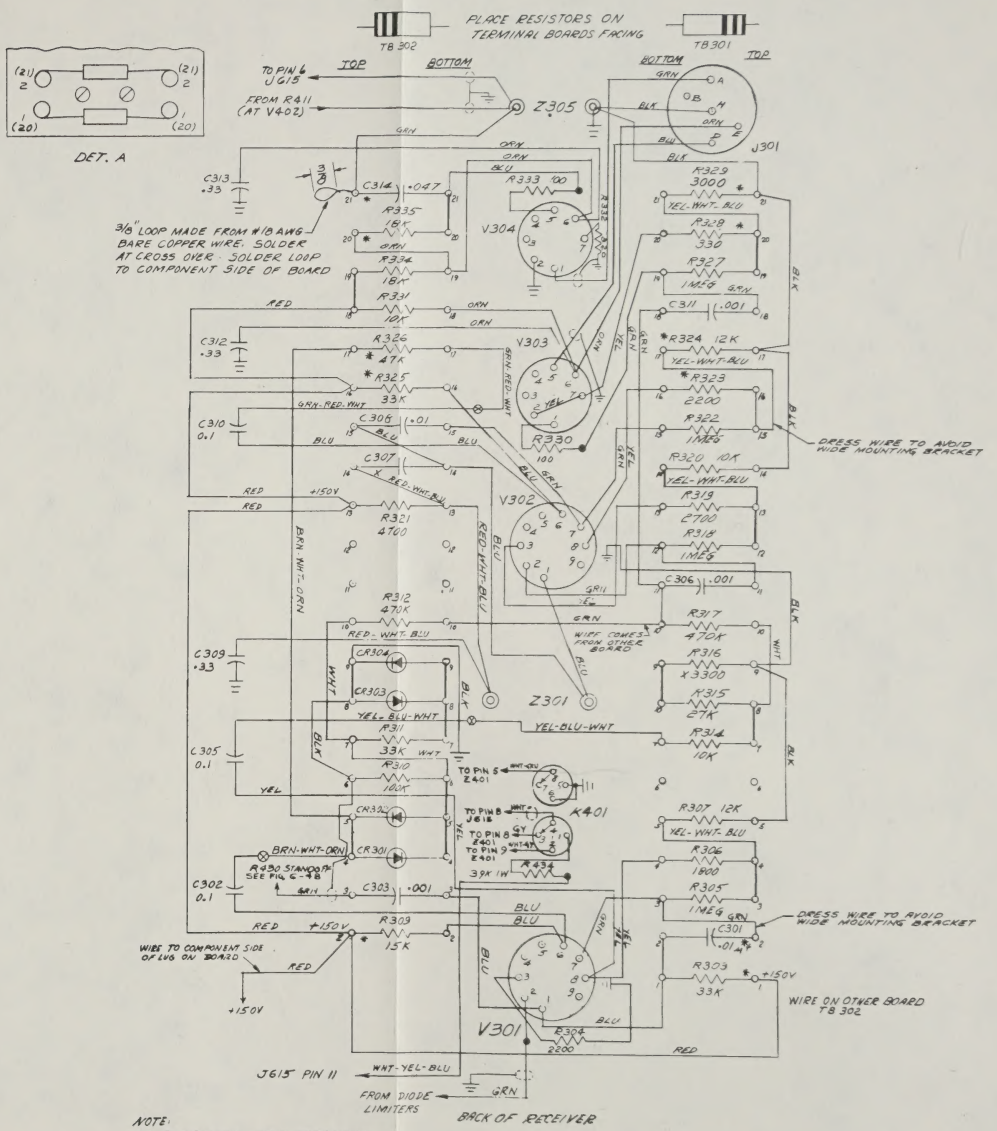
BFO and Audio, Wiring Diagram


PLACE RESISTORS ON TERMINAL BDS. FACING
TB 402
TB 401
FROM C303 TERM 3 TOP TB 302
FROM Z 305
GRN
BLU-WHT
PIN 4 ON U614
V401
V402
V403
T401
Z401
C401 470 VUF
C402
C403 .22
C404 .022
C405 .33
C406 .0047
C407 .01
C408 .93
CR401
R401 1MEG
R402 1MEG
R403 33K
R404 100
R405 750
R406 47K 1W
R407 27K
R408 56K
R409 1MEG
R410 1MEG
R411 220K
R412 4300
R413 150K
R414 47K
R415 390
R416 4300
R417 100
R418 2700
R419 100
R420 1MEG
R421 100
R422 1W
R423 1200
R424 4300
R425 1W
R426 1W
R427 1200
R428 2700
R431 1200
R432 750
R433 22K
CR402
CR403
C410 .33
C411 .01
C412 .01
C413 .01
C414 .01
C415 .01
C416 .01
C417 .01
C418 .01
C419 .01
C420 .01
C421 .01
C422 .01
C423 .01
C424 .01
C425 .01
C426 .01
C427 .01
C428 .01
C429 .01
C430 .01



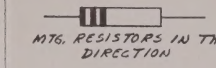
and Narrow Band IF, Wiring Diagram

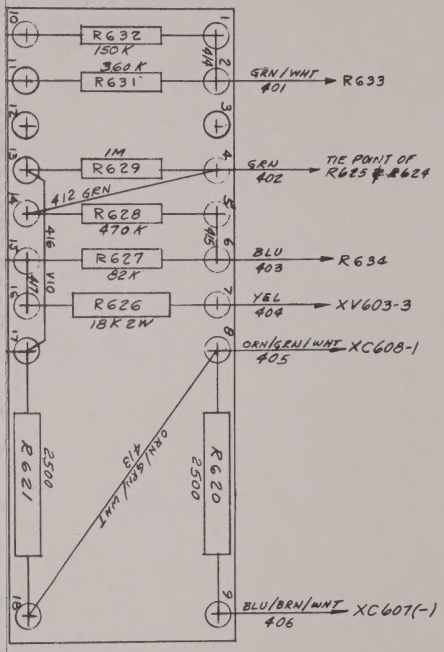




NOTE:
1. ⊗ INDICATES FEED THROUGH
2. * COMPONENTS MOUNTED IN POSITIONS INDICATED BY ASTERISKS MUST BE DRESSED TO ALLOW FREE PASSAGE OF THE HEADS OF 6-32 ROUND HEAD SCREWS. SEE DET. A
3. UNLESS OTHERWISE SPECIFIED: RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARAD.

Figure 6-49. Noise Cancellation and Narrow Band IF, Wiring Diagram

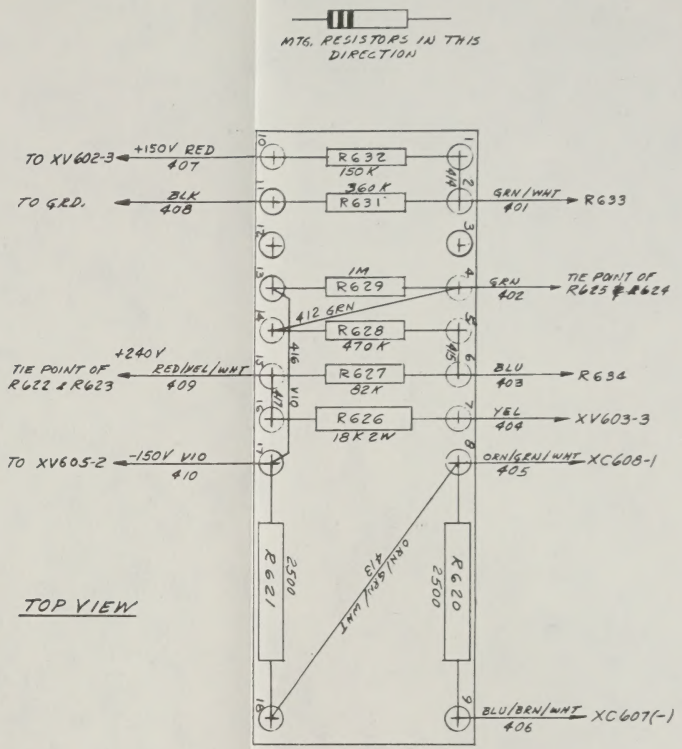




	TB603-10		TB603-1	—	
	TB603-11		TB603-2	—	
	TB603-12		TB603-3	—	
	TB603-13		TB603-4	—	
	TB603-14		TB603-5	—	
	TB603-15		TB603-6	—	
	TB603-16		TB603-7	—	
	TB603-17		TB603-18	—	
	TB603-8		TB603-9	—	
	TB603-15		TB603-16	1"	15
	TB603-13		TB603-17	1"	14
	TB603-5		TB603-6	1"	13
	TB603-1		TB603-2	1"	12
WHT	TB603-18		TB603-8	3½"	9
	TB603-14		TB603-4	2½"	8
	TB603-17		XV605-2	7¾"	14
WHT	TB603-15		TIE PT R622,R623	6"	13
	TB603-11		GRD ⏚	5"	12
	TB603-10		XV602-3	8"	11
WHT	TB603-9		XC607(-)	7"	10
WHT	TB603-8		XC608-1	6½"	9
	TB603-7		XV603-3	4⅞"	8
	TB603-6		R634 @	4⅜"	7
	TB603-4		TIE PT R625,R624	4½"	6
	TB603-2		R635 @	5"	5
WD GA.	FROM	VIA	TO	LENGTH	ITEM NO.

ON C607 MTG. SCREW NEAREST TO(+) TERMINAL
STANDOFF

50. TB603, Wiring Diagram



E632	—	TB603-10		TB603-1	—	
E631	—	TB603-11		TB603-2	—	
E630	—	TB603-12		TB603-3	—	
E629	—	TB603-13		TB603-4	—	
E628	—	TB603-14		TB603-5	—	
E627	—	TB603-15		TB603-6	—	
E626	—	TB603-16		TB603-7	—	
E621	—	TB603-17		TB603-10	—	
E620	—	TB603-8		TB603-9	—	
417		TB603-15		TB603-16	1"	15
416	V10	TB603-13		TB603-17	1"	14
415		TB603-5		TB603-6	1"	13
414		TB603-1		TB603-2	1"	15
413	ORN-GRN-WHT	TB603-18		TB603-8	3½"	9
412	GRN	TB603-14		TB603-4	2½"	6
410	V10	TB603-17		XV605-2	7¾"	14
409	RED/YEL/WHT	TB603-13		TIE PT R622,623	6"	13
408	BLK	TB603-11		GRD ✱	5"	12
407	RED	TB603-10		XV602-3	8"	11
406	BLU/BRN/WHT	TB603-9		XC607(-)	7"	10
405	ORN/GRN/WHT	TB603-8		XC608-1	8½"	9
404	YEL	TB603-7		XV603-3	4⅞"	8
403	BLU	TB603-6		R634 ⊗	4⅝"	7
402	GRN	TB603-4		TIE PT R625,R624	4½"	6
401	GRN/WHT	TB603-2		R633 ⊗	5"	5
WIRE NO. OR SYMB.	COLOR AND AMER. WIRE GA.	FROM	VIA	TO	LENGTH	ITEM NO.

✱ GRD LUG ON C607 MTG. SCREW NEAREST TO(+) TERMINAL
⊗ TIED TO STANDOFF

Figure 6-50. TB603, Wiring Diagram

SECTION 7
PARTS LIST

7-1. INTRODUCTION.

Reference designations (previously referred to as circuit symbols, reference symbols, etc.) have been assigned to identify all maintenance parts of the equipment. They are included on drawings, diagrams, photographs, and parts list. Reference designations of electrical or electronic parts are also used for marking the equipment (adjacent to the part they identify). The letters of a reference designation indicate the kind of part (generic group), such as resistor, amplifier, electron tube, miscellaneous mechanical part, etc. The number differentiates between parts of the same generic group. Parts of the equipment are numbered from 101 to 699. These number groups are assigned to the different electrical parts of Radio Receiver R-988/BRR-3 as follows:

Series 101 to 199: Antenna coupling circuits

Series 201 to 299: Tunable RF mixer and variable IF circuits

Series 301 to 399: Noise cancellation and narrow band IF circuits

Series 401 to 499: Audio circuits

Series 501 to 599: FSK detecting and teletype keyer circuits

Series 601 to 699: Power supply, CRT circuits, front panel, and interconnecting wiring

Thus, a series of one hundred numbers in a generic group is not completely used before using numbers of the next series. Sockets associated with a particular plug-in device, such as an electron tube or a fuse, are identified by a reference designation which includes the reference designation of the plug-in device. For example, the socket for fuse F603 is designated XF603.

Stock Number Identification Tables (SNIT) or Allowance Parts Lists (APL) issued by the Electronics Supply Office include Federal Stock Numbers and Source Maintenance and Recoverability Codes. Therefore, reference shall be made to the appropriate SNIT or APL for this information.

7-2. MAINTENANCE PARTS LIST.

Table 7-1 lists the equipment and its maintenance parts. Column 1 lists the entire reference series for the equipment followed by the reference designations of the various parts in alphabetical and numerical order. All the reference designations in each series of one hundred numbers are listed before the reference designations in the next series of one hundred numbers are listed. Column 2 refers to the explanatory note that appears in paragraph 7-4 below. Column 3 gives the name and describes the various parts. Information classified higher than the parts list has been omitted; however, such information has been referenced in Section 1. Complete information is given for all key parts (parts differing from any part previously listed in this table). The name and description are omitted for other parts. However, reference is made to the key part for the data. Column 4 indicates how the part is used and gives its functional location in the equipment. It also includes the figure number of the pictorial illustration on which the part is identified.

7-3. LIST OF MANUFACTURERS.

Table 7-2 lists manufacturers of parts used in the equipment. The first column includes the code numbers used in table 7-1 to identify manufacturers.

7-4. NOTES.

The following provides additional information about items listed in table 7-1.

1. This item is chosen at factory test. If it is defective replace with the identical part. For replacement purposes, there will be attached to the following units parts which must be used in the locations listed below:

Unit replaced	Also replace this item
Z301	C307 on TB302
Z401	C410 (already soldered on Z401)
Z501	C503 (already soldered on Z501) R512 on TB501 R513 on TB501

SUPPLEMENT TO PARTS LIST

REF DESIG	NOTES	NAME & DESCRIPTION	LOCATING FUNCTION
J618		CONNECTOR, RECEPTACLE, ELECTRICAL: plastic dielectric; MIL-C-5015B type no. MS3102A-22-27S	Back of chassis antenna receptacle Figure 6-17

TABLE 7-1. RADIO RECEIVING SET AN/BRR-3, MAINTENANCE PARTS LIST
RADIO RECEIVER R-988/BRR-3

REF. DESIG	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
101-699		RECEIVER, RADIO: R-988/BRR-3 classified "Confidential"; 90348 part no. NUS 4791	See Section 1
C101		CAPACITOR, VARIABLE, GLASS DIELECTRIC: 1 uuf min, 7 uuf max capacity; 14674 part no. 682055	Resonating, Antenna Coupling, Figure 6-26
C102		CAPACITOR, FIXED, MICA DIELECTRIC: 5 uuf ± 1 uuf; 300v dc; MIL-C-5A type no. CM15B050M	Resonating, Antenna, Coupling, Figure 6-28
C103		Same as C101	Resonating, Antenna Coupling, Figure 6-26
C104		Not used	
C105		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 600v dc; 1.5 uuf ± 0.1 uuf; insulated body; 72982 type NPO, style 315	High Side, Antenna Coupling, Figure 6-28
C106		CAPACITOR, FIXED, PLASTIC DIELECTRIC: 3900 uuf ± 10%; 200v dc; metal case; 84411 part no. 615G39292W4	Q compensating network, Antenna Coupling, Figure 6-28
C107		Same as C106	Q compensating network, Antenna Coupling, Figure 6-28
C108		CAPACITOR, FIXED, MICA DIELECTRIC: 3300 uuf ± 2%; 500v dc; MIL-C-5A type no. CM30E332G	Low Side, Antenna Coupling, Figure 6-28
C109		CAPACITOR, FIXED, MICA DIELECTRIC: 1800 uuf ± 2%; 500v dc, MIL-C-5A type no. CM30E182G	Dummy Antenna, Figure 6-28
C110 Cont. See C201		CAPACITOR, FIXED, PLASTIC DIELECTRIC: .047 uf ± 10%; 200v dc; metal case; 84411 part no. 615G47392W4.	Coupling Figure 6-26
L101 Cont. See L601		REACTOR: 1 coil; 480 uh inductance; 90348 dwg no. B2184948	Dummy Antenna Figure 6-26
MP101		KNOB: setscrew type; plastic body; 90348 dwg no. B2184582	Antenna Selector, front panel, Figure 6-21
MP102 Cont. See MP201		EXTENSION SHAFT: brass; 71002 part no. 538 modified; 90348 dwg no. A2183813G1	p/o MP101, Figure 6-9
R101		RESISTOR, FIXED, COMPOSITION: 2200 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF222J	Q compensating network, Antenna Coupling, Figure 6-28
R102		Same as R101	Q compensating network, Antenna Coupling, Figure 6-28
R103 Cont. See R201		RESISTOR, FIXED, COMPOSITION: 75,000 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF753J	AGC Feed Figure 6-28
S101 Cont. See S301		SWITCH, ROTARY: 3 sections; 71590 part no. PA-2029 modified; 90348 dwg no. B2184396	Antenna Selector, Figure 6-26

C101

TABLE 7-1. RADIO RECEIVING SET AN/BRR-3, MAINTENANCE PARTS LIST
RADIO RECEIVER R-988/BRR-3

REF. DESIG	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
T101		TRANSFORMER, AUDIO FREQUENCY: 760 mh inductance rating,0.9 ohms dc resistance primary winding; 1.02 h inductance rating, 480 ohms dc resistance rating secondary winding; 90348 dwg no. C2184523	Antenna Coupler, Figure 6-26
T102 Cont. See T201		TRANSFORMER, AUDIO FREQUENCY: two primary and two secondary windings; winding H-L has 1.02 h inductance rating with 480 ohms dc resistance; A-B has 760 uh inductance rating with 0.9 ohms dc resistance; R-F has 300 uh inductance rating with 1.6 ohms dc resistance; 90348 dwg no. C2184524	Antenna Coupler, Figure 6-26
A201		CONVERTER, FREQUENCY, ELECTRONIC: 14 to 30 kc incoming freq range, 2.5 kc resultant freq; 90348 dwg no. H2183342	RF Head Figure 6-8
B201 Cont. See B601		SYNCHRO, TRANSMITTER: 26v system voltage, 400 cycles system freq; 0.114 amp energizing current, 0.65 w energizing power; 88818 type no. R1011-A modified; 90348 dwg no. A2183808	Remote tuning, RF Head, Figure 6-26
C201 A-D		CAPACITOR, VARIABLE, AIR DIELECTRIC: 5 sect; 15 uuf min to 235 uuf max, capacity ea sect; straight line capacity tuning characteristic ea sect; 230v ac peak voltage ea section; 25 steel plates front sect; 25 brass plates ea other sect; 77630 dwg no. U-994; 90348 dwg no. D2184812	Resonating, main tuning, Figure 6-16
C202 A-E		Same as C201	Resonating, main tuning, Figure 6-16
C203		CAPACITOR, FIXED, PAPER DIELECTRIC: 330,000 uuh ± 10%; 200v dc; MIL-C-25A type no. CP11A3KC334K	Decoupling, V201, Figure 6-26
C204		CAPACITOR, FIXED, PAPER DIELECTRIC: 330,000 uuf ± 10%; 400v dc; MIL-C-25A type no. CP11A3KE334K	Decoupling, V201, Figure 6-26
C205		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 500v dc; 18 uuf ± 2%; insulated body; 72982 style K, N2200	Resonating, temperature, compensating, V201, Figure 6-28
C206		Same as C101	Resonating, V206, Figure 6-26
C207		Same as C106	Q compensating network, V201, Figure 6-28
C208		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 500v dc; 0.82 uuf ± 0.1 uuf; insulated body; 72982 type NPO, style 315	High Side Coupling, V201, Figure 6-28
C209		CAPACITOR, FIXED, MICA DIELECTRIC: 3600 uuf ± 2%; 500v dc; MIL-C-5A type no. CM35E362G	Low Side Coupling, V201, Figure 6-28
C210		Same as C205	Resonating, temperature compensating, V201, Figure 6-28
C211		Same as C101	Resonating, V201, Figure 6-26
C212		CAPACITOR, FIXED, PLASTIC DIELECTRIC: 3300 uuf ± 10%; 200v dc; metal case; 84411 part no. 615G33292W4	Q compensating network, V201, Figure 6-28
C213		Same as C203	Decoupling, V202, Figure 6-26
C214		CAPACITOR, FIXED, PAPER DIELECTRIC: 220,000 uuf ± 10%; 400v dc; MIL-C-25A type no. CP11A3KE224K	Decoupling, V202, Figure 6-26
C215		Same as C205	Resonating, temperature comp., V202, Figure 6-27

TABLE 7-1. RADIO RECEIVING SET AN/BRR-3, MAINTENANCE PARTS LIST
RADIO RECEIVER R-988/BRR-3

REF. DESIG	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C216		Same as C101	Resonating, V202, Figure 6-26
C217		Same as C212	Q compensating network, V202, Figure 6-27
C218		Same as C208	High side Coupling, V202, Figure 6-27
C219		Same as C209	Low side Coupling, V202, Figure 6-27
C220		Same as C205	Resonating, temperature comp., V202, Figure 6-27
C221		Same as C101	Resonating, V202, Figure 6-26
C222		Same as C212	Q compensating network, V202, Figure 6-27
C223		Same as C203	Decoupling, V203, Figure 6-26
C224		Same as C204	Decoupling, V203, Figure 6-26
C225		Same as C205	Resonating, temperature comp., V203, Figure 6-27
C226		Same as C101	Resonating, V203, Figure 6-26
C227		Same as C212	Q compensating network, V203, Figure 6-27
C228		Same as C209	Low side coupling, V203, Figure 6-27
C229		Same as C208	High side coupling, V203, Figure 6-27
C230		Same as C205	Resonating, temperature comp., V203, Figure 6-27
C231		Same as C101	Resonating, V203, Figure 6-26
C232		Same as C212	Q Compensating network, V203, Figure 6-27
C233		Same as C203	Decoupling, V204, Figure 6-26
C234		Same as C203	Decoupling, V204, Figure 6-26
C235		CAPACITOR, FIXED, MICA DIELECTRIC: 1000 uuf $\pm$ 2%; 500v dc; MIL-C-5A type no. CM30E102G	Coupling, V204, Figure 6-27
C236		CAPACITOR, FIXED, MICA DIELECTRIC: 200 uuf $\pm$ 2%; 300 v dc; MIL-C-5A type no. CM15D201G	Parasitic suppressor filter, V205, Figure 6-26
C237		CAPACITOR, FIXED, MICA DIELECTRIC: 820 uuf $\pm$ 2%; 300v dc; MIL-C-5A type no. CM20D821G	Parasitic suppressor filter, V205, Figure 6-26

C216

TABLE 7-1. RADIO RECEIVING SET AN/BRR-3, MAINTENANCE PARTS LIST
RADIO RECEIVER R-988/BRR-3

REF. DESIG	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C238		Same as C236	Parasitic suppressor filter, V205, Figure 6-26
C239		Same as C237	Parasitic suppressor filter, V205, Figure 6-26
C240		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 500v dc; 18 uuf ± 0.5 uuf; insulated body; 72982 style K, N1775 (± 300 PPM)	Resonating, temperature compensating, V205, Figure 6-27
C241		Same as C101	Resonating, V205, Figure 6-26
C242		CAPACITOR, FIXED, MICA DIELECTRIC: 1300 uuf ± 2%; 500 v dc; MIL-C-5A type no. CM30E132G	Padder, V205, Figure 6-27
C243		CAPACITOR, FIXED, CERAMIC DIELECTRIC: 500v dc; 200 uuf ± 5%; insulated body; 72982 style 811, UJ characteristic	Padder, temperature compensating, V205, Figure 6-27
C244		Same as C204	Decoupling, V205, Figure 6-26
C245		Same as C204	Decoupling, V204, Figure 6-26
C246		Same as C204	Decoupling, V204, Figure 6-26
C247		Same as C203	Decoupling, V206, Figure 6-26
C248		Same as C204	Decoupling, V206, Figure 6-26
C249		Same as C212	Coupling, V206, Figure 6-26
C250		Same as C203	Decoupling, V207, Figure 6-26
C251		CAPACITOR, FIXED, PLASTIC DIELECTRIC: 10,000 uuf ± 10%; 200v dc; metal case; 84411 part no. 615G10392 W4	Filter, V207, Figure 6-26
C252		Same as C204	Decoupling, V207, Figure 6-26
C253		Same as C212	Coupling, V207, Figure 6-26
C254		Same as C203	Decoupling, V208, Figure 6-26
C255		Same as C204	Decoupling, V208, Figure 6-26
C256		CAPACITOR, FIXED, MICA DIELECTRIC: 180 uuf ± 5%; 300v dc; MIL-C-5A type no. CM15C181J	Filter, V202, Figure 6-26
C257 Cont. See C301		Same as C256	Filter, V203, Figure 6-26
E201		TERMINAL, FEEDTHRU, INSULATED: plastic insulation; brass conductor; 98291 part no. FT-1000	Test point, Antenna Coupling, Figure 6-26
E202		Same as E201	Test point, V201, Figure 6-26
E203		Same as E201	Test point, V201, Figure 6-26
E204		Same as E201	Test point, V204, Figure 6-26
E205		Same as E201	Test point, V202, Figure 6-26

REF. DESIG	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
E206		Same as E201	Test point, V202, Figure 6-26
E207		Same as E201	Test point, V202, Figure 6-26
E208		Same as E201	Test point, V202, Figure 6-26
E209		Same as E201	Test point, V203, Figure 6-26
E210		Same as E201	Test point, V203, Figure 6-26
E211		Same as E201	Test point, V203, Figure 6-26
E212		Same as E201	Test point, V203, Figure 6-26
E213		Same as E201	Test point, V204, Figure 6-26
E214		Same as E201	Test point, V205, Figure 6-26
E215		TERMINAL, STUD: plastic insulation; brass conductor; 98291 part no. ST-1000	Test point, Antenna Coupling, Figure 6-26
K201 Cont. See K401		RELAY, ARMATURE: dpdt, Ref Dwg Group 217; 115v ac, 28v dc, 2 amp resistive current contact rating; 78277 part no. 22RJCC8000GSIL	Bandwidth Selector, Noise Cancellation, Figure 6-26
MP201		SPRING ASSEMBLY: 1-5/32 in. h by 1-9/32 in. w by 1-3/8 in. lg approx over-all dim.; 90348 dwg no. B2184213	Tensions MP216, Figure 6-16
MP202		COUPLING, MALE: steel per Fed Spec QQ-S-763, class 7, condition A; 90348 dwg no. A2184238	Mates w/B201 shaft coupling, Figure 6-16
MP203		COUPLING, FEMALE: steel per Fed Spec QQ-S-763, class 7, condition A; 90348 dwg no. A2184239	B201 shaft coupling, Figure 6-16
MP204		COUPLING, FEMALE: steel per Fed Spec QQ-S-763, class 7, condition A; 90348 dwg no. A2184241	R227 shaft coupling, Figure 6-16
MP205		COUPLING, MALE: steel per Fed Spec QQ-S-763, class 7, condition A; 90348 dwg no. A2184240	Mates w/R227 shaft coupling, Figure 6-16
MP206		COUPLING ASSEMBLY: c/o 1 coupling, 1 spring, 2 screws, 2 lockwashers; 90348 dwg no. B2183393	Coupling to C201, Figure 6-16
MP207		Same as MP206	Coupling to C202, Figure 6-16
MP208		COUPLING: aluminum per Fed Spec QQ-A-355, temper T4; 0.250 in. thk by 3/8 in. w by 1-1/2 in. lg over-all; 90348 dwg no. A2183377	p/o MP206, Figure 6-20
MP209		Same as MP208	p/o MP207, Figure 6-20
MP210		SPRING: phosphor bronze per Fed Spec QQ-P-330, composition A, H temper; 0.020 in. thk by 1/4 in. w by 11/16 in. lg over-all; 90348 dwg no. A2183392	p/o MP206, Figure 6-20
MP211		Same as MP210	p/o MP207, Figure 6-20
MP212		KNOB: setscrew type; plastic body; 90348 dwg no. B2184580	RF Tuning, front panel, Figure 6-21
MP213		CLUTCH, FRICTION: c/o 1 housing, 1 plug, 1 extension shaft, 1 "o" ring; 90348 dwg no. B2184565	p/o MP212, Figure 6-21
MP214		CLIP, SPRING TENSION: beryllium copper per Fed Spec QQ-P-416, type I, class 2; 90348 dwg no. A2184428	Secures RF Head handle, Figure 6-16

E206

TABLE 7-1. RADIO RECEIVING SET AN/BRR-3, MAINTENANCE PARTS LIST
RADIO RECEIVER R-988/BRR-3

REF. DESIG	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
MP215		COUNTER, ROTATING, FIXED MOUNTING: 3 white figures on black background; 18911 part no. 3-D-8861L, AC modified; 90348 dwg no. 2183638	RF Tuning frequency indicator, front panel, Figure 6-16
MP216		CHAIN, BEAD: corrosion resisting steel; 55 beads; 70892 part no. 3, qualified bead chain, 55 beads, cres, passivate	Coupling between MP218 and MP219, Figure 6-20
MP217		GEAR, SPUR: phosphor bronze per Fed Spec QQ-P-330, composition A, hard; 88 teeth; 90348 dwg no. A2183373	p/o MP221, Figure 6-20
MP218		SPROCKET WHEEL: brass per Fed Spec QQ-B-613, composition 2, 1/2 hard; 20 teeth; 7/16 in. lg by 0.750 in. dia over-all; 90348 dwg no. A2183442	Drives MP215, Figure 6-20
MP219		SPROCKET WHEEL: brass per Fed Spec QQ-B-613, composition 2, 1/2 hard; 20 teeth; 0.187 in. w by 0.750 in. dia over-all; 90348 dwg no. A2183403	p/o drive to MP215, Figure 6-20
MP220		SHAFT, SHOULDERED: steel per Fed Spec QQ-S-763, class 7, type A; 0.1872 in. dia by 0.917 in. lg approx over-all; 90348 dwg no. A2183402	Mounts MP219 and MP221, Figure 6-20
MP221		GEAR ASSEMBLY: c/o 1 spur gear, 1 disk, 4 screws; 90348 dwg no. B2183441	p/o drive to MP215, Figure 6-20
MP222 Cont. See MP301		GEAR, SPUR: steel per Fed Spec QQ-S-763, class 7, condition A; 59 teeth; 90348 dwg no. A2183372	p/o drive to MP215, Figure 6-20
R201		RESISTOR, FIXED, COMPOSITION: 100 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF101J	Parasitic suppressor, V201, Figure 6-26
R202		RESISTOR, FIXED, COMPOSITION: 3900 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF392J	Decoupling, V201, Figure 6-28
R203		RESISTOR, FIXED, COMPOSITION: 10,000 ohms ± 5%; 1 w; MIL-R-11B type no. RC32GF103J	Decoupling, V201, Figure 6-28
R204		RESISTOR, FIXED, COMPOSITION: 4700 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF472J	Q compensating network, V201, Figure 6-28
R205		Same as R204	Q compensating network, V201, Figure 6-28
R206		RESISTOR, FIXED, COMPOSITION: 15,000 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF153J	Filter, V202, Figure 6-26
R207		Same as R202	Decoupling, V202, Figure 6-28
R208		Same as R203	Decoupling, V202, Figure 6-27
R209		Same as R204	Q compensating network, V202, Figure 6-27
R210		Same as R204	Q compensating network, V202, Figure 6-27
R211		Same as R206	Filter, V203, Figure 6-26
R212		Same as R202	Decoupling, V203, Figure 6-27
R213		Same as R203	Decoupling, V203, Figure 6-27
R214		Same as R204	Q Compensating network, V203, Figure 6-27

MP215

TABLE 7-1. RADIO RECEIVING SET AN/BRR-3, MAINTENANCE PARTS LIST
RADIO RECEIVER R-988/BRR-3

REF. DESIG	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R215		Same as R204	Q compensating network, V203, Figure 6-27
R216		Same as R201	Parasitic suppressor, V204, Figure 6-26
R217		Same as R202	Decoupling, V204, Figure 6-27
R218		Same as R202	Decoupling, V204, Figure 6-26
R219		Same as R201	Parasitic suppressor, V204, Figure 6-26
R220		RESISTOR, FIXED, COMPOSITION: 22,000 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF223J	Mixer grid, V204, Figure 6-26
R221		RESISTOR, FIXED, COMPOSITION: 8200 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF822J	Parasitic Suppressor Filter, V205, Figure 6-26
R222		RESISTOR, FIXED, COMPOSITION: 33,000 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF333J	Parasitic Suppressor Filter, V205, Figure 6-26
R223		Same as R221	Parasitic Suppressor Filter, V205, Figure 6-26
R224		Same as R222	Parasitic Suppressor Filter, V205, Figure 6-26
R225		Same as R201	Parasitic suppressor, V205, Figure 6-26
R226		RESISTOR, FIXED, FILM: 43,000 ohms ± 1%; 1/2 w; MIL-R-19074B type no. RI94EH43001K	Decoupling, V205, Figure 6-27
R227		RESISTOR, VARIABLE, LINEAR PRECISION: 1 section; 20,000 ohms ± 5%; ± 0.5% linearity; 2 w power rating at 40 deg C ambient temp; 73138 type 5403, 20,000 ohms, modified, 90348 dwg no. A2183807	Frequency Gain Control, V202, V203, Figure 6-26
R228		RESISTOR, FIXED, COMPOSITION: 39,000 ohms ± 5%; 1 w; MIL-R-11B type no. RC32GF393J	Relay dropping, K201, Figure 6-26
R229		Same as R202	Decoupling, V204, Figure 6-26
R230		Same as R202	Decoupling, V204, Figure 6-26
R231		Same as R202	Decoupling, V206, Figure 6-26
R232		Not used	
R233		Same as R201	Parasitic suppressor, V206, Figure 6-26
R234		Not used	
R235		Same as R203	Decoupling, V206, Figure 6-26
R236		RESISTOR, FIXED, COMPOSITION: 100,000 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF104J	Grid leak, V207, Figure 6-26
R237		Same as R202	Decoupling, V207, Figure 6-26

R215

TABLE 7-1. RADIO RECEIVING SET AN/BRR-3, MAINTENANCE PARTS LIST
RADIO RECEIVER R-988/BRR-3

REF. DESIG	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R238		Same as R201	Parasitic suppressor, V207, Figure 6-26
R239		RESISTOR, FIXED, COMPOSITION: 3300 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF332J	Plate load, V207, Figure 6-26
R240		Same as R203	Decoupling, V207, Figure 6-26
R241		RESISTOR, FIXED, COMPOSITION: 39,000 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF393J	Grid leak, V208, Figure 6-26
R242		Same as R202	Decoupling, V208, Figure 6-26
R243		Same as R201	Parasitic suppressor, V208, Figure 6-26
R244		Same as R203	Decoupling, V208, Figure 6-26
Cont. See R302			
T201		TRANSFORMER, INTERMEDIATE FREQUENCY: 14 to 30 kc freq range; 90348 dwg no. C2184521	RF transformer Figure 6-26
T202		Same as T201	RF transformer, Figure 6-26
T203		Same as T201	RF transformer, Figure 6-26
T204		Same as T201	RF transformer, Figure 6-26
T205		Same as T201	RF transformer, Figure 6-26
T206		Same as T201	RF transformer, Figure 6-26
T207		TRANSFORMER, INTERMEDIATE FREQUENCY: 16.5 to 32.5 kc freq range; 90348 dwg no. C2184522	Oscillator transformer Figure 6-26
Cont. See T401			
V201		ELECTRON TUBE: MIL-E-1D type no. 5749/6BA6W	1st TRF Amplifier, Figure 6-16
V202		Same as V201	2nd TRF Amplifier, Figure 6-16
V203		Same as V201	3rd TRF Amplifier, Figure 6-16
V204		ELECTRON TUBE: MIL-E-1D type no. 5750/6BE6W	Mixer, Figure 6-16
V205		ELECTRON TUBE: MIL-E-1D type no. 6AU6WA	Oscillator, Figure 6-16
V206		Same as V201	1st IF Amplifier, Figure 6-16
V207		Same as V201	2nd IF Amplifier, Figure 6-16
V208		Same as V201	3rd IF Amplifier, Figure 6-16
Cont. See V301			
XV201		SOCKET, ELECTRON TUBE: silver plated copper base alloy contacts; JAN-S-28A type no. TS102C01	u/w V201, Figure 6-26
XV202		Same as XV201	u/w V202, Figure 6-26
XV203		Same as XV201	u/w V203, Figure 6-26
XV204		Same as XV201	u/w V204, Figure 6-26

R238

TABLE 7-1. RADIO RECEIVING SET AN/BRR-3, MAINTENANCE PARTS LIST
RADIO RECEIVER R-988/BRR-3

REF. DESIG	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
XV205		Same as XV201	u/w V204, Figure 6-26
XV206		Same as XV201	u/w V206 Figure 6-26
XV207		Same as XV201	u/w V207 Figure 6-26
XV208 Cont. See XV301		Same as XV201	u/w V208, Figure 6-26
Z201		FILTER, BAND PASS: 2.5 kc operating freq, 170 cycles bandwidth; 90348 dwg no. B2185028	Narrow Band Filter, IF Amplifier, Figure 6-16
Z202		FILTER, BAND PASS: 2.5 kc operating freq, 1900 cycles bandwidth; 90348 dwg no. B2184500	Wide Band Filter, IF Amplifier, Figure 6-26
Z203 Cont. See Z301		FILTER, BAND PASS: 2.5 kc operating freq; 90348 dwg no. B2184956	Filter, V206, Figure 6-16
C301		CAPACITOR, FIXED, PAPER DIELECTRIC: 10,000 uuf ± 10%; 400v dc; MIL-C-25A type no. CP05A1KE103K	Coupling, V301, Figure 6-30
C302		CAPACITOR, FIXED, PAPER DIELECTRIC: 100,000 uuf ± 10%; 400v dc; MIL-C-25A type no. CP11A1KE104K	Plate coupling, V301, Figure 6-16
C303		CAPACITOR, FIXED, PAPER DIELECTRIC: 1000 uuf ± 10%; 600v dc; MIL-C-25A type no. CP05A1KF102K	Coupling, V401, Figure 6-29
C304		Not used	
C305		Same as C302	Coupling, Noise Cancellation, Figure 6-16
C306		Same as C303	Grid coupling, V302, Figure 6-30
C307	1	CAPACITOR, FIXED, MICA DIELECTRIC: 330 uuf ± 5%; 300v dc; MIL-C-5A type no. CM15D331J	Resonating, Feedback Amplifier, Figure 6-29
C308		Same as C301	Coupling, V302, Figure 6-29
C309		Same as C204	Decoupling, Feedback Amplifier, Figure 6-16
C310		Same as C302	Coupling, Noise Cancellation, Figure 6-16
C311		Same as C303	Coupling, V303, Figure 6-30
C312		Same as C204	Decoupling, V303, Figure 6-30
C313		Same as C204	Decoupling, V304, Figure 6-30
C314		CAPACITOR, FIXED, PAPER DIELECTRIC: 47,000 uuf ± 10%; 400v dc; MIL-C-25A type no. CP05A1KE473K	Coupling, V304, Figure 6-29
C315 Cont. See C401		Same as C204	Decoupling, Wide Band IF, Figure 6-30
CR301		SEMICONDUCTOR DEVICE, DIODE: MIL-E-ID type no. 1N459	Gate, Noise Cancellation, Figure 6-29

XV205

ABLE 7-1. RADIO RECEIVING SET AN/BRR-3, MAINTENANCE PARTS LIST
ADIO RECEIVER R-988/BRR-3

REF. DESIG	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
CR302		Same as CR301	Gate, Noise Cancellation, Figure 6-29
CR303		Same as CR301	Gate Tracking, Noise Cancellation, Figure 6-29
CR304		Same as CR301	Gate Tracking, Noise Cancellation, Figure 6-29
CR305		Same as CR301	Limiter, Wide Band IF, Figure 6-30
CR306 Cont. See CR401		Same as CR301	Limiter, Wide Band IF, Figure 6-30
J301 Cont. See J601		CONNECTOR, RECEPTACLE, ELECTRICAL: arc resistant plastic dielectric; 81312 part no. M5S-LRN	Narrow Band Filter Connector, Figure 6-29
MP301		KNOB: setscrew type; plastic body; 90348 dwg no. B2184581	Bandwidth, front panel, Figure 6-21
MP302		EXTENSION SHAFT: brass; 71002 part no. 538 modified; 90348 dwg no. A2183813G2	p/o MP301, Figure 6-9
MP303 Cont. See MP501		SHIELD, COIL: steel; 90348 dwg no. A2184042	Cover for Z302 and Z303, Narrow Band IF Filter Assembly, Figure 6-10
P301 Cont. See P601		CONNECTOR, PLUG, ELECTRICAL: 5 contacts; one connector mating end; 81312 part no. M5P-LS with hood M5H16	Narrow Band Filter Connector, Figure 6-31
R301		Not used	
R302		Same as R236	Limiter, Wide Band IF, Figure 6-30
R303		Same as R222	Plate load, V301, Figure 6-30
R304		Same as R101	Cathode bias, V301, Figure 6-29
R305		RESISTOR, FIXED, COMPOSITION: 1 meg ± 5%; 1/2 w; MIL-R-11B type no. RC20GF105J	Grid leak, V301, Figure 6-30
R306		RESISTOR, FIXED, COMPOSITION: 1800 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF182J	Cathode bias, V301, Figure 6-30
R307		RESISTOR, FIXED, COMPOSITION: 12,000 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF123J	Cathode load, V301, Figure 6-30
R308		Not used	
R309		Same as R206	Plate load, V301, Figure 6-29
R310		Same as R236	Gate Tracking, Noise Cancellation, Figure 6-29

TABLE 7-1. RADIO RECEIVING SET AN/BRR-3, MAINTENANCE PARTS LIST
RADIO RECEIVER R-988/BRR-3

REF. DESIG	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R311		Same as R222	Gate Tracking, Noise Cancellation, Figure 6-29
R312		RESISTOR, FIXED, COMPOSITION: 470,000 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF474J	Summing, Noise Cancellation, Figure 6-29
R313		Not used	
R314		RESISTOR, FIXED, COMPOSITION: 10,000 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF103J	Voltage divider, Noise Cancellation, Figure 6-30
R315		RESISTOR, FIXED, COMPOSITION: 27,000 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF273J	Voltage divider, Noise Cancellation, Figure 6-30
R316	1	RESISTOR, FIXED, COMPOSITION: 3300 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF332J	Impulse nulling, Noise Cancellation, Figure 6-30
R317		Same as R312	Summing, Noise Cancellation, Figure 6-30
R318		Same as R305	Grid leak, V302, Figure 6-30
R319		RESISTOR, FIXED, COMPOSITION: 2700 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF272J	Cathode bias, V302, Figure 6-30
R320		Same as R314	Feedback, V302, Figure 6-30
R321		Same as R204	Decoupling, Feedback Amplifier, Figure 6-29
R322		Same as R305	Grid leak, V302, Figure 6-30
R323		Same as R101	Cathode bias, V302, Figure 6-30
R324		Same as R307	Feedback amplitude setting, Figure 6-30
R325		Same as R222	Plate load, V302, Figure 6-29
R326		RESISTOR, FIXED, COMPOSITION: 47,000 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF473J	Isolation, Noise Cancellation, Figure 6-29
R327		Same as R305	Grid leak, V303, Figure 6-30
R328		RESISTOR, FIXED, COMPOSITION: 330 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF331J	Cathode bias, V303, Figure 6-30
R329		RESISTOR, FIXED, COMPOSITION: 3000 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF302J	Feedback, V303, Figure 6-30
R330		Same as R201	Parasitic suppressor, V303, Figure 6-29
R331		Same as R314	Decoupling, V303, Figure 6-28

R311

TABLE 7-1. RADIO RECEIVING SET AN/BRR-3, MAINTENANCE PARTS LIST
RADIO RECEIVER R-988/BRR-3

REF. DESIG	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R332		RESISTOR, FIXED, COMPOSITION: 820 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF821J	Cathode bias, V304, Figure 6-30
R333		Same as R201	Parasitic suppressor, V304, Figure 6-29
R334		RESISTOR, FIXED, COMPOSITION: 18,000 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF183J	Decoupling, V304, Figure 6-29
R335		Same as R334	Plate load, V304, Figure 6-29
R336		Not used	
R337		Not used	
R338 Cont. see R401		Same as R319	Decoupling, Wide Band IF, Figure 6-30
S301 Cont. see S601		SWITCH, ROTARY: 1 section; 71590 part no. PA-2006; 90348 dwg no. A2185027	Bandwidth Selector, Figure 6-31
TB301		TERMINAL BOARD: 42 solder stud type terminals incl; 90348 dwg no. B2184782	Component mtg, Figure 6-30
TB302 Cont. see TB401		TERMINAL BOARD: 42 solder stud type terminals incl; 90348 dwg no. B2184783	Component mtg, Figure 6-29
V301		ELECTRON TUBE: MIL-E-1D type 5814A	Amplifier/Phase Splitter, Figure 6-16
V302		Same as V301	Feedback Amplifier, Figure 6-16
V303		Same as V205	Amplifier, Figure 6-16
V304 Cont. see V401		Same as V205	Amplifier, Figure 6-16
XV301		SOCKET, ELECTRON TUBE: silver plated copper base alloy contacts, JAN-S-28A type no. TS103C01	u/w V301, Figure 6-29
XV302		Same as XV301	u/w V302, Figure 6-29
XV303		Same as XV201	u/w V303, Figure 6-29
XV304 Cont. see XV401		Same as XV201	u/w V304, Figure 6-29
Z301		FILTER, BAND PASS: 2.5 kc operating freq; 90348 dwg no. B2184501	Filter, V302, Figure 6-29
Z302		FILTER, BAND PASS: 2.5 kc operating freq; 170 cycles bandwidth; 93048 dwg no. B2183557	Filter, Narrow Band IF, Figure 6-31
Z303		FILTER, BAND PASS: 2.5 kc operating freq; 420 cycles bandwidth; 90348 dwg no. B2183558	Filter, Narrow Band IF, Figure 6-31
Z304		FILTER, BAND PASS: 2.5 kc operating freq; 60 cycles bandwidth; 90348 dwg no. B2183559	Filter, Narrow Band IF, Figure 6-31
Z305		FILTER, BAND PASS: 2.5 kc operating freq; 90348 dwg no. B2184502	Filter, Narrow Band IF, Figure 6-29
Z306 Cont. see Z401		Same as Z202	Filter, Wide Band IF, Figure 6-30

R332

TABLE 7-1. RADIO RECEIVING SET AN/BRR-3, MAINTENANCE PARTS LIST
RADIO RECEIVER R-988/BRR-3

REF. DESIG	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
C401		CAPACITOR, FIXED, MICA DIELECTRIC: 470 uuf ± 5%; 300 v dc; MIL-C-5A type no. CM15D471J	Coupling, V401, Figure 6-29
C402		CAPACITOR, FIXED, PAPER DIELECTRIC: 100,000 uuf ± 10%; 400 v dc; MIL-C-25A type no. CP11A3KE104K	Filter, AGC, Figure 6-16
C403		Same as C214	AGC time constant, Figure 6-16
C404		CAPACITOR, FIXED, PAPER DIELECTRIC: 22,000 uuf ± 10%; 600v dc; MIL-C-25A type no. CP05A1KF223K	Filter, AGC, Figure 6-29
C405		Same as C204	Decoupling, BFO, Figure 6-16
C406		Same as C204	Decoupling, BFO, Figure 6-16
C407		Same as C301	Coupling, V403, Figure 6029
C408		CAPACITOR, FIXED, PAPER DIELECTRIC: 4700 uuf ± 10%; 600v dc; MIL-C 25A type no. CP05A1KF472K	Phase shifter, V403, Figure 6-29
C409		Same as C204	Decoupling, V403, Figure 6-16
C410 Cont. See C501	1	CAPACITOR, FIXED, MICA DIELECTRIC: 62 uuf ± 5%; 300v dc; MIL-C-25A type no. CM15D620J	Fine tune 1000 cps Figure 6-29
CR401		Same as CR301	Detector, AGC, Figure 6-29
CR402		Same as CR301	Gate Diode, AGC Delayed, Figure 6-30
CR403 Cont. See CR501		Same as CR301	Gate Diode, AGC, Figure 6-30
K401		Same as K201	Audio 600/1000 cps, Figure 6-29
R401		Same as R305	Diode load, CR401, Figure 6-29
R402		Same as R305	AGC time constant, Figure 6-29
R403		Same as R222	Filter, AGC, Figure 6-29
R404		Same as R201	Parasitic suppressor, V401, Figure 6-29
R405		RESISTOR, FIXED, COMPOSITION: 1500 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF152J	AGC Voltage delay, Figure 6-30
R406		RESISTOR, FIXED, COMPOSITION: 47,000 ohms ± 5%; 1 w; MIL-R-11B type no. RC32GF473J	Cathode bias, V401, Figure 6-30
R407		Same as R315	Grid return, V204, Figure 6-30
R408		RESISTOR, FIXED, COMPOSITION: 56,000 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF563J	Grid return, V201, Figure 6-30
R409		Same as R206	Voltage divider, AGC, Figure 6-30

C401

TABLE 7-1. RADIO RECEIVING SET AN/BRR-3, MAINTENANCE PARTS LIST
RADIO RECEIVER R-988/BRR-3

REF. DESIG	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R410		Same as R305	Voltage divider, AGC, Figure 6-30
R411		RESISTOR, FIXED, COMPOSITION: 220,000 ohms, ± 5%; 1/2 w; MIL-R-11B type no. RC20GF224J	Isolating, BFO, Figure 6-29
R412 to R415		Not used	
R416		RESISTOR, FIXED, COMPOSITION: 4300 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF432J	Cathode bias, V402, Figure 6-29
R417		Same as R201	Parasitic suppressor, V402, Figure 6-29
R418		RESISTOR, FIXED, COMPOSITION: 150,000 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF154J	Decoupling, V402, Figure 6-29
R419		Same as R326	Decoupling, V402, Figure 6-29
R420		Not used	
R421		Same as R201	Parasitic suppressor V403, Figure 6-29
R422		Same as R222	Plate load, V403, Figure 6-29
R423		RESISTOR, FIXED, COMPOSITION: 1100 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF112J	Cathode bias, V403, Figure 6-30
R424		Same as R204	Feedback, Audio Amplifier Figure 6-30
R425		Same as R305	Grid leak, V403, Figure 6-29
R426		RESISTOR, FIXED, COMPOSITION: 390 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF391J	Cathode bias, V403, Figure 6-29
R427		Same as R201	Parasitic suppressor, V403, Figure 6-29
R428		Same as R319	Decoupling, V403, Figure 6-29
R429		Same as R305	Grid leak, V401, Figure 6-30
R430		Same as R201	Parasitic suppressor, V401 Figure 6-29
R431		RESISTOR, FIXED, COMPOSITION: 1200 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF122J	Feedback, V401, Figure 6-30
R432		Same as R405	Cathode bias, V401, Figure 6-30
R433		Same as R220	Plate load, V401, Figure 6-30
R434		Same as R228	Relay dropping, K401, Figure 6-29
Cont. See R501 T401 Cont. See T601		TRANSFORMER, AUDIO FREQUENCY: 20,000 ohms center tapped primary impedance rating; 600, 150ohms secondary impedance rating; MIL-T-27A type no. TF4RX13YY; 80223 type no. H-7	Audio output, Figure 6-29

TABLE 7-1. RADIO RECEIVING SET AN/BRR-3, MAINTENANCE PARTS LIST
RADIO RECEIVER R-988/BRR-3

REF. DESIG	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
TB401		TERMINAL BOARD: 34 solder stud type terminals incl; 90348 dwg no. B2184784	Component mtg, Figure 6-30
TB402 Cont. See TB501		TERMINAL BOARD: 34 solder stud type terminals incl; 90348 dwg no. B2184785	Component mtg, Figure 6-29
V401		ELECTRON TUBE: MIL-E-1D type no. 12AT7WA	Gain Control Amplifier, Figure 6-16
V402		Same as V401	Converter, Figure 6-16
V403 Cont. See V501		Same as V401	Audio Amplifier, Figure 6-16
XV401		Same as XV301	u/w V401, Figure 6-29
XV402		Same as XV301	u/w V402, Figure 6-29
XV403 Cont. See XV501		Same as XV301	u/w V403, Figure 6-29
Z401 Cont. See Z501		FILTER, BANDPASS: 3.1 or 3.5 kc operating freq of oscillator segment, 0.6 or 1 kc operating freq of audio filter segment, 90348 dwg no. B2271539	Filter, Converter, Figure 6-29
C501		CAPACITOR, FIXED, MICA DIELECTRIC: 510 uuf ± 5%; 300v dc; MIL-C-5A type no. CM15D511J	Coupling, V501, Figure 6-30
C502		Same as C501	Coupling, V502, Figure 6-29
C503	1	CAPACITOR, FIXED, MICA DIELECTRIC: 330 uuf ± 5%; 300v dc; MIL. C-5A type no. CM15D331J	Fine Discriminator, Figure 6-30
C504		CAPACITOR, FIXED, PAPER DIELECTRIC: 15,000 uuf ± 10%; 400v dc; MIL-C-25A type no. CP09A1KE153K	Filter, Discriminator, Figure 6-30
C505		CAPACITOR, FIXED, PAPER DIELECTRIC: 2200 uuf ± 10%; 600v dc; MIL-C-25A type no. CP05A1KF222K	Filter, V504, Figure 6-30
C506		Same as C504	Filter, Discriminator, Figure 6-29
C507		Same as C504	Filter, V504, Figure 6-30
C508		Same as C301	Filter, V504, Figure 6-29
C509		Same as C302	Filter, V504, Figure 6-16
C510		CAPACITOR, FIXED, PAPER DIELECTRIC: 1 uf ± 10%; 200v dc; MIL-C-25A type no. CP11A1KC105K	Coupling, V505, Figure 6-16
C511		Same as C402	Filter, V506, Figure 6-16
C512		Same as C402	Filter, V506, Figure 6-16
C513		Same as C303	Bypass, V507, Figure 6-29
C514		Same as C204	Decoupling, V503, Figure 6-16
C515 Cont. See C601		Same as C204	Decoupling, V503, Figure 6-16
CR501		Same as CR301	Detector, Figure 6-30
CR502		Same as CR301	Detector, Figure 6-29
CR503		Same as CR301	Detector, Teletype Keyer, Figure 6-30

TABLE 7-1. RADIO RECEIVING SET AN/BRR-3, MAINTENANCE PARTS LIST
RADIO RECEIVER R-988/BRR-3

REF. DESIG	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
CR504 Cont. See CR601		Same as CR301	Detector, Teletype Keyer, Figure 6-30
MP501 Cont. See MP601		SHIELD, COIL: steel; 90348 dwg no. B2183938	p/o Z501, rear deck chassis assembly, Figure 6-16
R501		RESISTOR, FIXED, COMPOSITION: 750,000 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF754J	Cathode bias, V501, Figure 6-30
R502		Same as R411	Plate load, V501, Figure 6-30
R503		Same as R411	Plate load, V501, Figure 6-30
R504		RESISTOR, FIXED, COMPOSITION: 2.2 meg ± 5%; 1/2 w; MIL-R-11B type no. RC20GF225J	Grid leak, V502, Figure 6-30
R505		Same as R501	Cathode bias, V502 Figure 6-29
R506		Same as R411	Plate load, V502, Figure 6-29
R507		Same as R411	Plate load, V502, Figure 6-29
R508		Same as R504	Grid leak, V503, Figure 6-29
R509		RESISTOR, FIXED, COMPOSITION: 10 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF100J	Parasitic suppressor, V503, Figure 6-30
R510		RESISTOR, FIXED, COMPOSITION: 51,000 ohms ± 5% w; MIL-R-11B type no. RC32GF513J	Cathode bias, V503, Figure 6-29
R511		Same as R509	Parasitic suppressor, V503, Figure 6-30
R512		Same as R239	Voltage divider, Discriminator, Figure 6-30
R513		Same as R510	Diode load, CR501, Figure 6-30
R514		RESISTOR, FIXED, COMPOSITION: 560,000 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF564J	Filter, V504, Figure 6-30
R515		Same as R408	Diode load, CR502, Figure 6-29
R516		RESISTOR, FIXED, COMPOSITION: 82,000 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF823J	Cathode bias, V504, Figure 6-30
R517		Same as R220	Filter, V504, Figure 6-30
R518		Same as R411	Filter, V504, Figure 6-30
R519		Same as R516	Cathode bias, V504, Figure 6-29
R520		RESISTOR, FIXED, COMPOSITION: 390,000 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF394J	Filter, V504, Figure 6-29

CR504

TABLE 7-1. RADIO RECEIVING SET AN/BRR-3, MAINTENANCE PARTS LIST
RADIO RECEIVER R-988/BRR-3

REF. DESIG	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R521		RESISTOR, VARIABLE: composition; 100,000 ohms ± 10%; 1/3 w; std A taper, Ref Dwg Group 3; single rd metal shaft 0.125 in. dia by 1/2 in. lg from mtg surface w/0.032 in. w by 0.032 in. lg slot, normal torque; MIL-R-94A type no. RV6NAYSB104A	CRT Centering, Figure 6-29
R522		RESISTOR, FIXED, COMPOSITION: 3.3 meg ± 5%; 1/2 w; MIL-R-11B type no. RC20GF335J	Voltage setting, V504, Figure 6-29
R523		Same as R241	Plate load, V505, Figure 6-29
R524		Same as R312	Coupling, V505, Figure 6-29
R525		Same as R305	Voltage setting, V505, Figure 6-29
R526		Same as R220	Cathode bias, V505, Figure 6-30
R527		Same as R241	Plate load, V505, Figure 6-30
R528		RESISTOR, FIXED, COMPOSITION: 360,000 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF364J	Gain setting, V506, Figure 6-30
R529		Same as R305	Grid leak, V506, Figure 6-30
R530		RESISTOR, FIXED, COMPOSITION: 1.5 meg ± 5%; 1/2 w; MIL-R-11B type no. RC20GF155J	Filter, V506, Figure 6-30
R531		RESISTOR, FIXED, COMPOSITION: 4.7 meg ± 5%; 1/2 w; MIL-R-11B type no. RC20GF475J	Amplitude setting, V506, Figure 6-30
R532		Same as R522	Filter, V506, Figure 6-30
R533		Same as R516	Cathode bias, V506, Figure 6-29
R534		RESISTOR, VARIABLE: composition; 50,000 ohms ± 10%; 1/3 w; std A taper, Ref Dwg Group 3; single rd metal shaft 0.125 in. dia by 1/2 in. lg from mtg surface w/0.032 in. w by 0.032 in. lg slot, normal torque; MIL-R-94A no. RV6NAYSB503A	DC setting, V506, Figure 6-29
R535		Same as R408	Coupling, V507, Figure 6-29
R536		Same as R522	Voltage setting, V507, Figure 6-29
R537		Same as R228	Cathode bias, V507, Figure 6-29
R538		Same as R241	Plate load, V507, Figure 6-29
R539		RESISTOR, FIXED, COMPOSITION: 680,000 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF684J	Coupling, V507, Figure 6-29
R540		Same as R305	Voltage setting, V507, Figure 6-29
R541		Not used	
R542		Same as R222	Plate load, V507, Figure 6-30
R543		RESISTOR, FIXED, COMPOSITION: 240,000 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF244J	Coupling, V508, Figure 6-30
R544		Same as R528	Voltage setting, V508, Figure 6-30

R521

TABLE 7-1. RADIO RECEIVING SET AN/BRR-3, MAINTENANCE PARTS LIST
RADIO RECEIVER R-988/BRR-3

REF. DESIG	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R545		RESISTOR, FIXED, COMPOSITION: 7500 ohms ± 5%; 2 w; MIL. R-11B type no. RC42GF752J	Screen dropping, V508, Figure 6-29
R546		Same as R545	Screen dropping, V509, Figure 6-29
R547		Not used	
R548		Same as R319	Decoupling, V503, Figure 6-29
R549		Same as R319	Decoupling, V503, Figure 6-29
R550		Same as R201	Parasitic suppressor, V509, Figure 6-29
R551 Cont. See R601		Same as R201	Parasitic suppressor, V508, Figure 6-30
TB501		TERMINAL BOARD: 34 solder stud type terminals incl; 90348 dwg no. B2184786	Component mtg, Figure 6-30
TB502		TERMINAL BOARD: 33 solder stud type terminals incl, 1 terminal accommodated but not incl; 90348 dwg no. B2184787	Component mtg, Figure 6-29
TB503		TERMINAL BOARD: 34 solder stud type terminals incl; 90348 dwg no. B2184788	Component mtg, Figure 6-29
TB504 Cont. See TB601		TERMINAL BOARD: 33 solder stud type terminals incl, 1 terminal accommodated but not incl; 90348 dwg no. B2184789	Component mtg, Figure 6-29
V501		ELECTRON TUBE: MIL-E-1D type no. 5751	Cathode Coupled, Double Ended Clipper, Figure 6-16
V502		Same as V501	Cathode Coupled, Double Ended Clipper, Figure 6-16
V503		Same as V401	Cathode Coupled, Double Ended Clipper, Figure 6-16
V504		Same as V301	Cathode Follower, Figure 6-16
V505		Same as V301	Amplifier, Figure 6-16
V506		Same as V301	Cathode Follower, Figure 6-16
V507		Same as V301	DC Amplifier, Figure 6-16
V508		ELECTRON TUBE: MIL-E-1D type no 6005/6AQ5W	Teleprinter Power Amplifier, Figure 6-16
V509, Cont. See V601		Same as V508	Teleprinter Power Amplifier, Figure 6-16
XV501		Same as XV301	u/w V501, Figure 6-30
XV502		Same as XV301	u/w V502, Figure 6-30
XV503		Same as XV301	u/w V503, Figure 6-30
XV504		Same as XV301	u/w V504, Figure 6-30

R545

TABLE 7-1. RADIO RECEIVING SET AN/BRR-3, MAINTENANCE PARTS LIST
RADIO RECEIVER R-988/BRR-3

REF. DESIG	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
XV505		Same as XV301	u/w V505, Figure 6-30
XV506		Same as XV301	u/w V506, Figure 6-30
XV507		Same as XV301	u/w V507, Figure 6-1
XV508		Same as XV201	u/w V508, Figure 6-30
XV509		Same as XV201	u/w V509, Figure 6-30
Cont. See XV601			
Z501		TRANSFORMER, DISCRIMINATOR: 2.5 kc mid freq; 90348 dwg no. B2184951	Discriminator, Figure 6-30
B601		FAN ASSEMBLY: c/o motor B601A, mtg bracket MP621; venturi MP622, 3 in. fan blade MP623; 93289 part no. C1221-14; 90348 dwg no. A2270926	Receiver cooling, rear of cabinet, Figure 6-17
B601A		MOTOR, ALTERNATING CURRENT: 115v, 60cy, single phase; 93289 part no. C1121-20	p/o B601 Figure 6-17
C601		CAPACITOR, FIXED, MICA DIELECTRIC: 330 uuf ± 5%; 300v dc; MIL-C-5A type no. CM15D331J	Coupling, Audio Amplifier, Figure 6-23
C602		Same as C314	Coupling, V601, Figure 6-25
C603		Same as C314	Filter, V601, Figure 6-25
C604		CAPACITOR, FIXED, METALIZED PAPER DIELECTRIC: 4 uf ± 10%; 600v dc; MIL-C-18312A type no. CH53B1MF405K	Filter, Power Supply, Figure 6-24
C605		CAPACITOR, FIXED, ELECTROLYTIC: 2 sections; 20 uf ea section; MIL-C-62A type no. CE52F200R	Filter, Power Supply, Figure 6-16
C606		Not used	
C607		Same as C604	Filter, Power Supply, Figure 6-24
C608		CAPACITOR, FIXED, ELECTROLYTIC: 35 uf; 450v dc; MIL-C-62A type no. CE51F350R	Filter, Power Supply, Figure 6-16
C609		CAPACITOR, FIXED, PAPER DIELECTRIC: 500,000 uuf ± 10%; 400v dc; MIL-C-25A type no. CP53B1KE504K	Filter, Power Supply, Figure 6-23
C610		Same as C601	Coupling, V603, Figure 6-24
C611		CAPACITOR, FIXED, ELECTROLYTIC: 4 uf; 450v dc; MIL-C-62A type no. CE63F040R	Filter, V601, Figure 6-23
C612		CAPACITOR, FIXED, PAPER DIELECTRIC: 1 uf ± 10%; 600v dc; MIL-C-25A type no. CP53B1EF105K	Blower motor starting, Figure 6-17
C613		CAPACITOR, FIXED, PAPER DIELECTRIC: 3300 uuf ± 10%; 600v dc; MIL-C-25A type no. CP05A1KF332K	Coupling, V603, Figure 6-23
CR601		SEMICONDUCTOR DEVICE, DIODE: EIA type no. 1N1130	Rectifier, Power Supply, Figure 6-23
CR602		Same as CR601	Rectifier, Power Supply, Figure 6-23
CR603		Same as CR601	Rectifier, Power Supply, Figure 6-23
CR604		Same as CR601	Rectifier, Power Supply, Figure 6-23

XV505

TABLE 7-1. RADIO RECEIVING SET AN/BRR-3, MAINTENANCE PARTS LIST
RADIO RECEIVER R-988/BRR-3

REF. DESIG	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
DS601		LAMP, INCANDESCENT: 6v, 0.2 amp; AN327	Panel light, Figure 6-16
DS602		Same as DS601	Panel light, Figure 6-16
F601		FUSE, CARTRIDGE: 2 amp, 125v max; time delay; MIL-F-15160C type no. F02D2R00B	Line fuse, Figure 6-16
F602		Same as F601	Line fuse, Figure 6-16
J601		CONNECTOR, RECEPTACLE, ELECTRICAL: low loss plastic dielectric; BUSHIPS type no. UG-58A/U	Whip Antenna Input, cabinet back, Figure 6-17
J602		CONNECTOR, RECEPTACLE, ELECTRICAL: plastic dielectric; MIL-C-5015B type no. AN3102A-18-1P	Float Antenna Control, cabinet back Figure 6-17
J603		Same as J601	50 Ohm Antenna, cabinet back, Figure 6-17
J604		CONNECTOR, RECEPTACLE, ELECTRICAL: plastic dielectric; MIL-C-5015B type no. AN3102A-14S-7P	Teleprinter Output, cabinet back, Figure 6-17
J605		CONNECTOR, RECEPTACLE, ELECTRICAL: plastic dielectric; MIL-C-5015B type no. AN3102A-16S-4P	Power Input, cabinet back, Figure 6-17
J606		CONNECTOR, RECEPTACLE, ELECTRICAL: plastic dielectric; MIL-C-5015B type no. AN3102A-14S-7S	Audio Output, cabinet back, Figure 6-17
J607		Same as J601	Fore-AFt Antenna Input, cabinet back, Figure 6-17
J608		Same as J601	Fore-Aft Antenna Input, cabinet back, Figure 6-17
J609		Same as J601	Athwart Antenna Input, cabinet back, Figure 6-17
J610		Same as J601	Athwart Antenna Input, cabinet back, Figure 6-17
J611		CONNECTOR, RECEPTACLE, ELECTRICAL: plastic dielectric; 17419 part no. DM9606-12P	Back chassis antenna connector, Figure 6-11
J612		CONNECTOR, RECEPTACLE, ELECTRICAL: arc resistant plastic dielectric; 81312 part no. M9S-LRN	RF Unit Antenna Connector, Figure 6-23
J613		CONNECTOR, RECEPTACLE, ELECTRICAL: low loss plastic dielectric; 71468 part no. DA-15P	Main connector, RF Unit, Figure 6-26
J614		Same as J613	Rear connector, Figure 6-30
J615		Same as J613	Front connector, Figure 6-30
J616		JACK, TELEPHONE: spring leaf contact arrangement J4, Ref Dwg Group 4; JAN-J-641A type no. JJ-089; 82389 part no. C12AJAX	Audio Output, Figure 6-11
J617		CONNECTOR, RECEPTACLE, ELECTRICAL: plastic dielectric; 17419 part no. DM9606-19P	Back chassis, Figure 6-11

DS601

TABLE 7-1. RADIO RECEIVING SET AN/BRR-3, MAINTENANCE PARTS LIST
RADIO RECEIVER R-988/BRR-3

REF. DESIG	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
L601		REACTOR: 1 section, 10 henries over-all inductance, 150 ma dc, 110 ohms dc res; 22119 part no. FC 12	Filter, Power Supply, Figure 6-23
MP601		TUBE, FLEXIBLE NONMETALLIC, ELECTRICAL: 3/8 in. id, 28-1/2 in. lg; 90348 dwg no. B2183316	Cable duct, rear chassis to cabinet front, Figure 6-15
MP602		Same as MP601	Cable duct, rear chassis to cabinet front, Figure 6-15
MP603		SHIELD, ELECTRON TUBE: accommodates tube type 2BP1, tapered cylinder shape, open top; 90348 dwg no. B2184155	u/w V601, Figure 6-16
MP604		TRACK, SLIDING DOOR: 01561 part no. CTD-116, 1 pair (LH and RH), Z type mtg brackets, modified; 90348 dwg no. B2178431	Chassis track, inside cabinet, Figure 6-15
MP605		KEY, SOCKET HEAD SCREW: WRENCH; 90348 dwg no. B2185012	For bandwidth knob extension removal, Figure 6-9
MP606		PIN, SHOULDER, HEADLESS: steel per Fed Spec QQ-S-763a, class 7, condition A; 90348 dwg no. A2183227	Chassis guide pin, rear of panel, Figure 6-23
MP607		Same as MP608	Chassis guide pin, rear of panel, Figure 6-23
MP608		FILTER, AIR CONDITIONING: 0.50 in w by 4.03 in. dia over-all; 00736 part no. 122195-P-56A mod; 90348 dwg no. A2184640	Receiver cooling, rear of cabinet, Figure 6-12
MP609		HANDLE, BOW: brass per Fed Spec QQ-B-613, composition 2, 1/2 hard; 90348 dwg no. A2270253	p/o MP610, Figure 6-15
MP610		CATCH, FRICTION: brass body, steel ball; 70494 part no. 3067 (brass, with steel ball, adjustable); 90348 dwg no. A2270255	Retains air filter in cover.
MP611		PIN, SHOULDER, HEADLESS: steel per Fed Spec QQ-S-763a, class 7, condition A; 90348 dwg no. A2183228	Chassis guide pin, rear of chassis, Figure 6-4
MP612		Same as MP613	Chassis guide pin, rear of chassis, Figure 6-4
MP613		INSULATOR, PLATE: plastic per MIL-P-5425A, finish A; 90348 dwg no. A2184065	Power supply shield, chassis frame, Figure 6-22
MP614		SPRING,HELICAL, COMPRESSION: steel per QQ-S-423, composition FS304, condition B, 90348 dwg no. A2183907	Cable return, cabinet front, Figure 6-15
MP615		Same as MP616	Cable return, cabinet front, Figure 6-15
MP616		STRAP RETAINING: aluminum per Fed Spec QQ-A-318c, type 5052-H34; marked "A"; 90348 dwg no. B2184373G1	Rear chassis cable clamp, Figure 6-4
MP617		STRAP, RETAINING: aluminum per Fed Spec QQ-A-318c, type 5052-H34; marked "B"; 90348 dwg no. B2184373G2	Rear chassis cable clamp, Figure 6-4

L601

TABLE 7-1. RADIO RECEIVING SET AN/BRR-3, MAINTENANCE PARTS LIST
RADIO RECEIVER R-988/BRR-3

REF. DESIG	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
MP618		BEARING, BALL, ANNULAR: 06008 part no. ND-77R4	p/o B601, Figure 6-17
MP619		Same as MP629	p/o B601, Figure 6-17
MP620		CONE, FAN MOTOR: brass per Fed Spec QQ-B-626, composition 22, 1/2 hard; 1-3/4 in. lg by 1.812 in. dia over-all; 90348 dwg no. A2270337	Deflects cable, rear of B601, Figure 2-5
MP621		BRACKET, MOUNTING: 4-3/4 in. dia o/a; three 0.177 in. dia. holes equally spaced on 4.375 in. dia circle, three 0.1495 in. dia holes equally spaced on 1.281 in. dia circle; 90348 part no. A2184795	p/o B601 Figure 6-17
MP622		VENTURI: 4-11/16 in. dia o/a; three 0.177 in. dia holes equally spaced on 4.375 in dia circle; 90348 part no. A2184796	p/o B601 Figure 6-17
MP623		IMPELLER, FAN, AXIAL: 4 blades; 3 in. dia o/a; 93289 part no. 231-3B	p/o B601 Figure 6-17
P601 to P610		Not used	
P611		CONNECTOR, PLUG, ELECTRICAL: 12 contacts; one connector mating end; 17419 part no. DM9700-12S	Back chassis Antenna connector, Figure 6-4
P612		CONNECTOR, PLUG, ELECTRICAL: 9 contacts; one connector mating end; 81312 part no. M9P-LS with hood M5H16	Antenna coupling connector, Figure 6-26
P613		CONNECTOR, PLUG, ELECTRICAL: 15 contacts; one connector mating end; 71468 part no. DA-15S with std junction shell 19678-1	RF Unit plug, Figure 6-11
P614		Same as P613	Rear plug, Figure 6-11
P615		Same as P613	Front plug, Figure 6-11
P616		Not used	
P617		CONNECTOR, PLUG, ELECTRICAL: 19 contacts; one connector mating end; 17419 part no. DM9700-19S	Back chassis plug, Figure 6-4
R601		RESISTOR, FIXED, COMPOSITION: 560 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF561J	Audio output load, Figure 6-23
R602		RESISTOR, VARIABLE: composition; 100,000 ohms ± 10%; 1 w; std C taper, Ref Dwg Group 3; single rd metal shaft 0.250 in. dia by 7/8 in. lg from mtg surface w/0.047 in. w by 0.063 in. lg slot, normal torque; MIL-R-94A type no. RVNAYSD104C	Audio level Adjust Figure 6-11
R603		RESISTOR, VARIABLE: composition; 25,000 ohms ± 10%; 2 w; std A taper, Ref Dwg Group 3; single rd metal shaft 0.250 in. dia by 7/8 in. lg from mtg surface w/0.047 in. w by 0.063 in. lg slot, normal torque; MIL-R-94A type no. RVNAYSD104C	RF Gain, Manual, Figure 6-11
R604		RESISTOR, FIXED, COMPOSITION: 130,000 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF134J	Voltage divider, V601, Figure 6-25
R605		Same as R408	Voltage divider, V601, Figure 6-25
R606		Same as R305	Voltage divider, V601, Figure 6-25
R607		RESISTOR, FIXED, COMPOSITION: 2.7 meg ± 5%; 1/2 w; MIL-R-11B type no. RC20GF275J	Voltage divider, V601, Figure 6-25

MP618

TABLE 7-1. RADIO RECEIVING SET AN/BRR-3, MAINTENANCE PARTS LIST
RADIO RECEIVER R-988/BRR-3

REF. DESIG	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R608		Same as R305	Filter, V601, Figure 6-25
R609		Same as R411	Voltage divider, V601, Figure 6-25
R610		RESISTOR, FIXED, COMPOSITION: 91,000 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF913J	Voltage divider, V601, Figure 6-25
R611		Same as R202	Filter, V601, Figure 6-25
R612		RESISTOR, FIXED, COMPOSITION: 180,000 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF184J	Grid leak, V603, Figure 6-24
R613		Same as R312	
R614		Same as R201	Parasitic suppressor, V603, Figure 6-24
R615		RESISTOR, FIXED, COMPOSITION: 510,000 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF514J	Voltage divider, V601, Figure 6-24
R616		RESISTOR, FIXED, COMPOSITION: 1.2 meg ± 5%; 1/2 w; MIL-R-11B type no. RC20GF125J	Voltage divider, V601, Figure 6-24
R617		Same as R306	Cathode bias, V603, Figure 6-24
R618		Same as R307	Voltage divider, Frequency Gain control, Figure 6-24
R619		Same as R418	Voltage divider, AGC, Figure 6-24
R620		RESISTOR, FIXED, WIRE WOUND: 2500 ohms ± 5%; 10 w; MIL-R-26C type no. RW56G252	Filter, Power Supply, Figure 6-24
R621		Same as R620	Filter, power supply, Figure 6-24
R622		RESISTOR, FIXED, COMPOSITION: 47 ohms ± 5%; 1 w; MIL-R-11B type no. RC32GF470J	Parasitic suppressor, V602 Figure 6-24
R623		Same as R622	Parasitic suppressor, V602, Figure 6-24
R624		Same as R201	Parasitic suppressor, V602, Figure 6-24
R625		Same as R201	Parasitic suppressor, V602, Figure 6-24
R626		RESISTOR, FIXED, COMPOSITION: 18,000 ohms ± 5%; 2 w; MIL-R-11B type no. RC42GF183J	Current supply, V604, Figure 6-24
R627		Same as R516	Plate load, V603, Figure 6-24
R628		Same as R312	Voltage divider, Power supply, Figure 6-24

R608

TABLE 7-1. RADIO RECEIVING SET AN/BRR-3, MAINTENANCE PARTS LIST
RADIO RECEIVER R-988/BRR-3

REF. DESIG	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
R629		Same as R305	Voltage divider, Power Supply, Figure 6-24
R630		Not used	
R631		RESISTOR, FIXED, COMPOSITION: 360,000 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF364J	Voltage divider, Power Supply, Figure 6-24
R632		Same as R418	Voltage divider, Power Supply, Figure 6-24
R633		Same as R201	Parasitic suppressor, V603, Figure 6-24
R634		Same as R201	Parasitic suppressor, V634 Figure 6-24
R635		RESISTOR, FIXED, COMPOSITION: 15 ohms ± 5%; 1 w; MIL-R-11B type no. RC32GF150J	Filament dropping Power Supply, Figure 6-23
R636		Same as R635	Filament dropping Power Supply, Figure 6-23
R637		RESISTOR, FIXED, COMPOSITION: 6200 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF622J	CRT bias, V601, Figure 6-25
R638		RESISTOR, FIXED, COMPOSITION: 430,000 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF434J	AC voltage divider for CRT, Figure 6-23
R639		Same as R220	AC Voltage divider for CRT, Figure 6-23
R640		Not used	
R641		Same as R423	Minimum manual bias Figure 6-16
R642		RESISTOR, FIXED, COMPOSITION: 43,000 ohms ± 5%; 1/2 w; MIL-R-11B type no. RC20GF433J	Plate load, V603, Figure 6-24
S601		SWITCH, TOGGLE: dpdt; JAN-S-23 type no. ST27N	Noise Cancellation On-Off, Figure 6-11
S602		SWITCH, ROTARY: 1 section; 71590 part no. PA-2007; 90348 dwg no. A2270407	BFO 600, 1000, 2500 cps, Figure 6-11
S603		Same as S602	FSK Sense, Figure 6-11
S604		SWITCH, TOGGLE: spdt; JAN-S-23 type no. ST17D	AGC-Manual, Figure 6-11
S605		Same as S602	CRT Control, FSK Fine Tune-Set Level, CRT OFF Figure 6-21
S606		SWITCH, TOGGLE: dpst; JAN-S-23 type no. ST27K	Power On-Off, Figure 6-21
T601		TRANSFORMER, POWER, STEP-DOWN AND STEP-UP; primary winding input data 105, 115, or 125v, 50 to 60 cycles single phase; no. 1 secondary 250v 0.2 amp center tapped, no. 2 secondary 6.3v 12 amp, no. 3 secondary 6.3v 1 amp; 80223 type no. BN451, 90348 dwg no. B2184823	Power Supply and Filament Figure 6-23
TB601		TERMINAL BOARD: 28 solder stud type terminals incl; 90348 dwg no. B2184259	Component mtg, Figure 6-11

TABLE 7-1. RADIO RECEIVING SET AN/BRR-3, MAINTENANCE PARTS LIST
RADIO RECEIVER R-988/BRR-3

REF. DESIG	NOTES	NAME AND DESCRIPTION	LOCATING FUNCTION
TB602		TERMINAL BOARD: 14 solder stud type terminals incl; 90348 dwg no. B2184258	Component mtg, Figure 6-23
TB603		TERMINAL BOARD: 18 solder stud type terminals incl; 90348 dwg no. B2184260	Component mtg, Figure 6-23
V601		ELECTRON TUBE: MIL-E-1D type no. 2BP1	Tuning, Indicator, Figure 6-7
V602		ELECTRON TUBE: MIL-E-1D type no. 6080WA	Series Regulator, Power Supply, Figure 6-16
V603		Same as V401	Amplifier, Figure 6-16
V604		ELECTRON TUBE: MIL-E-1D type no. 6627/0B2WA	Voltage Reference, Power Supply, Figure 6-16
V605		ELECTRON TUBE: MIL-E-1D type no. OA2WA	Voltage Regulator, Power Supply, Figure 6-16
XC605		SOCKET, ELECTRON TUBE: silver plated copper base alloy contacts; JAN-S-28A type no. TS101C02	u/w C605, Figure 6-23
XC606		Not used	
XC607		Not used	
XC608		Same as XC605	u/w C608, Figure 6-23
XDS601		CLIP, ELECTRICAL: beryllium copper; 90348 dwg no. A2183639	u/w DS601, Figure 6-16
XDS602		Same as XDS601	u/w DS602, Figure 6-16
XF601		FUSEHOLDER: extractor post type; MIL-F-19207 type no. FHN20G	u/w F601, Figure 6-23
XF602		Same as XF601	u/w F602, Figure 6-23
XV601		SOCKET, ELECTRON TUBE: silver plated copper base alloy contacts; 71785 part no. 3B12	u/w V601, Figure 6-16
XV602		Same as XC605	u/w V602, Figure 6-23
XV603		Same as XV301	u/w V603, Figure 6-23
XV604		Same as XV201	u/w V604, Figure 6-23
XV605		Same as XV201	u/w V605, Figure 6-23

TB602

TABLE 7-2. RADIO RECEIVING SET AN/BRR-3, LIST OF MANUFACTURERS

CODE	NAME	ADDRESS
00736	Air Maze Corp.	25000 Miles Rd., Cleveland, Ohio
01561	Chassis-Trak Corp.	525 S. Webster Ave., Indianapolis, Ind.
06008	New Departure Div. of General Motors Corp.	Meriden, Conn.
14674	Corning Glass Works	95-6 Crystal St., Corning, N.Y.
17419	The Deutsch Co.	700 Avalon Blvd., Los Angeles, Calif.
18911	Durant Mfg. Co.	1958 No. Buffum St., Milwaukee, Wisc.
22119	Ferranti Electric, Inc.	30 Main St., New York, N.Y.
30817	Instrument Specialties Co., Inc.	254 Bergen Blvd., Little Falls, N.J.
70494	Corbin Cabinet Lock Div., American Hardware Corp.	New Britain, Conn.
70892	The Bead Chain Mfg. Co.	110 Mountain Grove St., Bridgeport, Conn.
71002	Birnbach Radio Co.	145 Hudson St., New York, N.Y.
71468	Cannon Electric Co.	3208 Humboldt St., Los Angeles, Calif.
71590	Centralab Div. of Glove Union, Inc.	984 E. Keefe Ave., Milwaukee, Wisc.
71785	Cinch Mfg. Corp.	1026 S. Homan Ave., Chicago, Ill.
72982	Erie Resistor Corp.	644 W. 12th St., Erie, Pa.
73138	Helipot Div. of Beckman Instruments, Inc.	2500 Fullerton Rd., Fullerton, Calif.
77630	Radio Condenser Co.	Davis and Capewood Sts., Camden, N.J.
78277	Sigma Instruments, Inc.	170 Pearl St., South Braintree, Mass.
80223	United Transformer Co.	150 Varick St., New York, N.Y.
81312	Winchester Electronics Co., Inc.	Willard Rd., Norwalk, Conn.
82389	Switchcraft, Inc.	5553 Elston Ave., Chicago, Ill.
84171	Arco Electronics, Inc.	64 White St., New York, N.Y.
84411	Good-All Electric Mfg. Co.	112 W. First St., Ogallala, Nebra.
88818	Kearfott Co., Inc.	Little Falls, N.J.
90348	Federal Telecommunication Lab. Co., Div. of International Telephone and Telegraph Corp.	500 Washington Ave., Nutley, N.J.
93289	Air Marine Motors, Inc.	369 Bayview Ave., Amityville, Long Island, N N.Y.
98291	Sealectro Corp.	186 Union Ave., New Rochelle, N.Y.

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